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ABSTRACT

This study on secondary education in the Soviet Union examines characteristics of the various kinds of secondary schools--general secondary education, secondary education, secondary specialized education, and vocational education--and aspects of the Soviet examination system. The first section on general secondary education provides information such as objectives; organization; marking and examination systems; enrollment; problems; basic curriculum; alternative programs; subject matter reform; teacher training; educational administration; and research in secondary education. Next, an overview of secondary specialized education, the training of specialized technicians or professional support personnel in a wide range of specialties, includes information on objectives, funding, entrance requirements, specialty fields of study, enrollment, terminology used to describe differences in Soviet Schools, courses of study, graduation requirements, teacher training, and administration and research in secondary specialized education. A third section focusing on vocational education presents an overview of purpose, traditional vocational skills, teacher training, administration, and research in vocational education. The final section is devoted to the final examination in Soviet secondary schools. Appendices making up nearly half of the publication provide the text of general instructions and questions for secondary school final examinations. Tables showing the 10-year curriculum in Russian and Ukrainian general secondary schools, the all-year curriculum in Estonian general secondary schools, and sample one-, two-, and three-year vocational school curriculums are provided where appropriate. (LH)

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FOREWORD

This study is one of a series of U.S. Department of Education studies on education in the Union of Soviet Socialist Republics. Others in the series available for purchase from the Superintendent of Documents, U.S. Government Printing Office, are Education in the U.S.S.R.: Current Status of Higher Education (SN 017-080-02062-2, 1980, $3.75) and Education in the U.S.S.R.: Research and Innovation (SN 017-080-01815-2, 1978, $1.75).

This study is the first in the series to focus on secondary education, a level of particular current interest in the United States, especially in the fields of science, mathematics and foreign languages. The study as a whole should be of interest to a variety of groups, comparative education professors and students, secondary school specialists, administrators and teachers, and researchers on the U.S.S.R.

The curricula and differences between diplomas and certificates of the various kinds of secondary schools and between diplomas from secondary vocational-technical schools and those from higher technical institutes should be of particular interest to college and university admissions officers and academic credentials services.

The author, Seymour M. Rosen is a specialist on education in the U.S.S.R. and the author of a number of publications on the subject, including those cited above.

Richard T. Thompson, Director
Division of Advanced Training
and Research

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INTRODUCTION

The formal education system in the U.S.S.R. is nationally standardized and completely state-controlled and public. It extends from kindergarten for children ages 3 to 7, through primary grades (ages 7-10) and secondary grades (ages 10-17), to undergraduate (late teens to early 20's) and graduate studies (early 20's plus).

Kindergartens are not compulsory, but enroll the majority of children in the large cities and a significant minority in small towns and rural areas. They are an important resource in a system where both parents typically work in the state economy. A standardized, national syllabus is provided to kindergarterns, outlining a daily schedule for children at each age level, including the instructional program, games and meals. Although most kindergarten instruction is in the area of upbringing, drawing, music and physical development, in the final kindergarten year, at age 6, children are given reading and writing instruction in preparation for the first primary garade of school. 1/

1/ Administration for Pre-School Upbringing of the Russian S.F.S.R., Ministry of Education, Programma Vostpitanie v detskom sadu (Program of Upbringing in Kindergarten), Prosveschenie Publishers, Moscow, 1971. An earlier version of this syllabus and a teacher's guide to accompany it have been translated into English and published by the Educational Testing Service under the editorship of Henry Chauncey. They are entitled Soviet Preschool Education, Volume I, Program of Instruction and Volume II Teachers Commentary (New York: Holt, Rinehart and Winston, Inc., 1969).

Children enter the first grade of school at the age of seven. The primary grades extend from the first to the third grades, or three years. Thet were formerly four years (grades 1 to 4), but the primary grade content was compressed in the 1970's into three rather than four years by redesigning the curriculum and by putting some academic content in the final year of kindergarten.

The primary grades curriculum is 24 hours a week, several hours less than the upper grades (see table, for a sample general education curriculum of grades 1-10). Subjects taught at the primary level are native language (plus Russian from the second grade if it is not the native language), arithmetic, art, music, physical education, and some elementary activities in "vocational training." Unlike in later grades, a class in grades 1-3 is taught by one teacher who remains with the same class through its progession from grades one to three.

Grades 4-8 are considered "incomplete secondary education," and the curriculum is expanded to include literature, algebra and geometry, history and geography, biology, physics and chemistry, and a foreign language: Pupils in a given district remain in the same school together for grades 1-8, and most remain in the same school for grades 1-10. (Separate secondary schools are exceptional).

After grade 8, there are three major types of "complete" or upper secondary education (grades 9-10, or 9-11), and each is discussed in detail in subsequent sections. Each is under the administrative control of a separate government agency. The first and largest in enrollments

is general secondary education, under the U.S.S.R. and republic Ministries of Education. The second in size and significance is secondary specialized education, under U.S.S.R. and republic Ministries of Higher and Secondary Specialized Education. The third, and a relative newcomer in providing complete secondary education is secondary vocational educational education, controlled by U.S.S.R, and republic State Committees for Vocational-Technical Education. All three of these agencies are under the chief executive agencies of government, the Councils of Ministries, through which their budgets are disbursed.

Higher education is available to graduates of all three types of complete secondary education, the great majority being graduates of general secondary schools. The major types of higher education institutions are ministries and specialized institutes (for engineering, medicine, medicine, education, and other fields). Courses of undergraduate study range from 4 to 6 years leading to a diploma. Graduate study, generally three years in duration, leads to the Candidate of Sciences degree, 2/

2/ For a full discussion of higher education, see the author's Education in the U.S.S.R.: Current Status of Higher Education, (Washington: U.S. Government Printing Office, 1980).

The principal legal bases for secondary as well as other levels of education in the U.S.S.R. are the Constitution of the U.S.S.R. and the Fundamentals of Legislation of the U.S.S.R. and Union Republics on Public Education. 3/

Article 45 of the new U.S.S.R constitution of October 1977 points out the rights of citizens to a free education in their native language, the institution of universal, compulsory secondary education and the broad development of vocational specialized secondary and higher education. The "Fundamentals of Legislation ... on Public Education" outlines the system of education of various types at every level and the responsibilities of the schools, students and parents. The "Fundamentals" were enacted in July 1973 by the U.S.S.R. Supreme Soviet (the national legislature to consolidate reform, laws and decrees since the preceding (and now superseded) overall education law of 1958.

2/ The "Fundamentals" are described in detail in the author's Education in the U.S.S.R., Recent Legislation and Statistics. DHEW Pub. No. (OE) 75-19117, Washington: U.S. GPO., 1975.

The education system is organized within a national and republic governmental apparatus, as already indicated, of ministries and committees, and at the same time is subject to Communist Party control at every level. Aside from general Party directives determining major policy, day-to-day education ideological activities are monitored from the Control Party apparatus in Moscow down to the local level.

There is a "Department for Science and Educational Institutions" under the CPSU (Communist Party of the Soviet Union) Central Committee which supervises the Ministries of Education and Higher and Secondary Specialized Education, among others. 4/ The Department has separate "Sectors: respectively for "Higher Educational Institutions," "Schools," and "Secondary Specialized and Vocational Technical Education," and counterparts. Each higher education institution in the country has a Communist Party office, with university and institute administrators reporting directly to that office. School directors at all levels tend to be Communist Party members subject to Party instructions and discipline.

4/ The Soviet Government ministries and other institutions supervised by each department of the Communist Party Central Committee are listed in Jerry F. Hough and Merle Fainsod's How The Soviet Union is Governed, pp. 413-417.

GENERAL SECONDARY EDUCATION

Overview

The objectives of Soviet secondary schools of general education are cited in the 1973 fundamental law on education: 1/

> Article 19. Chief Tasks of the Secondary General Educational School.
>
> The chief tasks of the secondary general education are:
>
> Implementation of general secondary education for children and youth, answering contemporary demands of social and scientific-technical progress, providing students with deep and sound knowledge of the fundamentals of the sciences; educating them to strive for continuous improvement of their knowledge, and in the ability to fulfill it independently and to apply it in practice;
>
> Formation in the young generation of a Marxist-Leninist world view, educating them in socialist internationalism, Soviet patriotism, and readiness to defend the socialist homeland . . .

1/ The "Fundamentals," op.cit., p. 16.

General secondary education, for pupils ages 10 to 17, extends from grades 4 to 10 in 12 of the 15 constituent republics which make up the U.S.S.R. For an example of one of the 12, see the 10-year curriculum of the Ukrainian S.S.R., Table 2. In the Baltic republics (Lithuania, Latvia and Estonia), secondary education extends from grades 4 to 11 (see the Estonian curriculum, Table 3). In the Baltic republics (Lithuania, Latvia and Estonia), secondary education extends from grades 4 to 11 (see the Estonian curriculum, Table 3).

Grades 4 to 8 are considered "incomplete secondary education," grades 8 until the mid 1970's representing the final year of compulsory education. Grades 9-10(11) of general secondary schools are considered "complete" secondary education, and represents the main ways of receiving the now required upper secondary education.

Students attend the secondary school of general education six days a week, Monday through Saturday. They have about six classes a day, each class "hour" lasting 45 minutes. The school year generally extends for 35 weeks, with summer vacation from sometime in June (varying dates in June by grade and republic) to the end of August. School vacations also include December to January 10 and a week in November and March.

The marking system is numerical, from two (lowest) to five (highest). Five is excellent, four is good, three is fair, and two is unsatisfactory. ("One" is used only in elementary schools and as a disciplinary measure).

A recent Soviet education publication provides an overview of the marking and examination system at various elementary/secondary levels (for details on the final secondary examinations, see Section 5 and the Appendix): 1/

> In the 1st to 8th grades the pupils are marked each school quarter. The quarterly mark takes into account the various marks received during the quarter; in the 9th and 19th(11th) grades the pupils are marked for the half year. In the higher grades there are "pass-failure" tests in the more difficult subjects. In a way, this prepares the pupils for the method of study at the university-level establishments.
>
> There are final examinations in the 8th and 10th (11th) grades. In the schools of the RSFSR /Russian Soviet Federated Socialist Republic/ 8th grade pupils have final examination in Russian (an essay, and an oral test) written tests in arithmetic and algebra and oral tests in geometry and algebra. In the 10th grade there are final examinations in literature (an essay and an oral test), written tests in algebra and elementary functions and oral tests in geometry, physics, chemistry, the History of the USSR, the social science, and a foreign language.
>
> All pupils who have received passing marks for the year (no less than a "3") are permitted to take the final examinations by a decision of the pedagogical council. An examining board decides on the mark to be given for each examination and takes into consideration the mark received for the year. Pupils who have failed in one or two examinations have the right to take them over again before the beginning of the next school year. Pupils of the 8th grade who fail even in one of the repeated examinations are left back. Pupils of the 10th (11th) grades may leave school in this case with a certificate which merely states that they have attended school for 10 (11) years. They have the right to take the final exams again the following year in the subjects they have failed. Pupils who have graduated from an eight-year school receive a certificate, as decided upon by the pedagogical council which gives them the right to enter the 9th grade of general education school, secondary specialized schools or vocational schools. Those who have completed secondary school receive a school leaving certificate which gives them the right to enter institutions of higher learning, technical schools and secondary specialized schools with a shorter term of study.

1/ N. Kuzin and M. Kondakov (eds.), Education in the USSR, Moscow: Progress Publishers (2d revised edition), 1977, pp. 66-67.

There are also marks for conduct, "excellent," "satisfactory" and "unsatisfactory." Students of the graduating classes of secondary schools who have received "unsatisfactory" in conduct are barred from the final examinations. They receive a certificate of attendance rather than a maturity certificate or diploma, but may take final exams and receive the maturity certificate or diploma within three years on condition they present a good character reference from their place of work.

The maturity certificate (attestat zrelosti) is granted to graduates of the general secondary school. Secondary specialized and secondary vocational schools grant a diploma (diplom), indicating secondary school completion and qualification in a vocation or specialty.

Total enrollments in grades 4-8 of day schools of general education in the 1977/78 school year were 22.1 million, in a gradual decline through the 1970's from the 26.3 million in 1970/71. Apparently these figures represent the demographic characteristics of a declining population in this age gorup, since schooling for the total age group is compulsory and virtually universal.

Enrollments in upper grades 9-10(11) were 10.7 million in 1977/78, a considerable increase since the 7.6 million enrollment of 1970/71. The increase reflects the state's adoption of universal secondary education throughout the U.S.S.R.

Evening and correspondence secondary schools of general education, including schools for working youth and adults are frequently located at a factory sites or in housing developments. They had enrollments in 1977-78 totalling 4.8 million, of which 4.5 million enrolled in grades 9-10(11).

Among the various problems in Soviet general elementary/secondary education, probably the main problem is the disparity between urban and rural schools. Students in rural school comprising nearly half of the total student population, are disadvantaged in the quality of their schools and teachers and further disadvantaged in access to higher education. Soviet education literature frequently complains of the quality of instruction equipment and libraries in rural schools, which are characterized as being seriously behind urban schools. Rural childrens are further deprived of museums, theaters and other cultural amenities, but more significantly they lack access to the extensive private (informal, non-state) national system which enables the relatively more affluent of the urban children to score well in examinations at the secondary level and in admissions examinations for higher education. 1/

Basic curriculums

There are three main types of curriculum for regular daytime (primary) secondary schools, dependent on the language of instruction:

1/ Richard B. Dobson, "Social Status and Inequality of Access to Higher Education in the USSR," in Jerome Karabel and A. H. Halsey (eds.) Power and Ideology in Education (New York: Oxford University Press 1977, pp. 254-275). Using Soviet data, Dobson also cites the linkage between the academic performance of Soviet students and the social and cultural level of their parents.

1) the Russian language 10-year curriculum for roughly half the population of the U.S.S.R., primarily used in the largest Soviet republic, the Russian Soviet Federated Socialist Republic, but also in Russian-language schools in the 14, minority republics (see the Russian example, Table 1).
2) the non-Russian or minority language 10-year curriculum of the major ethnic groups of 11 of the other 15 constituent republics of the U.S.S.R. (See the Ukrainian example, Table 2).
3) the 3 Baltic republics 11-year curriculums (see the Estonian example, Table 3).

The chief differences in the three curriculums relate to language, literature and culture. The Russian curriculum requires only an additional, foreign language. The other curriculums require native language and literature, including local culture and lore, Russian language and literature, and a foreign language. This additional load is handled in the Baltic republics by the additional year of studies. In the other minority republics, after the first grade there is less time devoted to native language and literature than in the Russian schools (since the study of Russian language begins for non-Russians in the second grade), and the number of school hours per week is extended at the secondary education level.

A new subject, "Fundamentals of the Soviet state structure and law," was introduced in the mid-1970's, and is indicated in the Russian curriculum. It is given in the eighth grade for one hour a week.

Alternative Programs

Among other types of schools of general education are schools for urban working youth and schools for rural youth. These are part-time schools for youth working full-time in the labor force, and may be scheduled in the evening or as so-called "alternating shifts" during the daytime. They sometimes bear the "evening (alternating shift)" title, vechernikh (smennykh), rather than the school for working or rural youth title, but are the same category of school.

These schools enroll 10 percent of the total general education school population, or about 4.8 million students in the 1977/78 school year. They are readily identified in site visits by the older age groups in attendance.

For children with both parents working or from single-parent homes, or with various other problems of care after the regular school day, there are alternatives to regular day schools in boarding schools (shkoly-internat) or extended-day schools (shkoly s prodlennym dnem). Considered in the 1950's the wave of the future ultimately for virtually all general secondary students, boarding schools have been retained and restricted to very selective use in the 1970's and have been largely supplanted by extended-day schools as a popular alternative.

Boarding schools continue to serve for children with one parent surviving, for children from remote rural or other residences, and those with delinquency or other special problems. An expensive form of education for which parents contribute by paying according to ability, boarding schools maintain youth under full day and night supervision, and they live at the schools year round.

Extended-(or prolonged-) day schools are available for working parents to leave students from early morning to evening. Students engage in organized extracurricular activities after their regular school programs, but return home each evening. Total enrollments for extended-day schools in the 1977/78 school year were 9.3 million.

Other types of schools of general education are for the talented and others who wish to concentrate in foreign languages or science and mathematics. Selected schools in the large cities begin foreign language instruction in the second rather than the fifth grade, and at the secondary level teach some standard subjects in the foreign language. Others provide an enriched curriculum of physics and mathematics. Graduates of these schools have some advantage in the competitive examinations for admission to higher education.

There are special schools of general education for the physically and mentally handicapped. Enrollments in these schools have grown slowly since the 1960's ranging from 1.7 million in 1975/66 to 2.5 million in 1977/78.

These schools are divided into such categories as Schools for the Deaf and Mute (Shkoly glukhonemykh detei, Schools for the Mentally Retarded (Shkoly dlia umstvenno otstalykh detei), Schools for the Visually Impaired (Shkoly slabovidiashchikh), and Schools for the Blind (Shkoly slepykh).

Subject Matter Reform

Both elementary and general secondary education has been undergoing a gradual but substantial reform for the past decade. The reform was introduced in the late 1960's to modernize the content of all courses, within the continuing framework of Communist ideology. Throughout the 1970's, new subject syllabuses and textbooks were devised and introduced on a large scale in the classrooms. Primary education was shortened and concentrated from 4 years to 3 years (grades 1-3).

A subject-by-subject breakdown, first of mathematics and sciences and then the humanities, indicates the scope and elements of the course content reform in secondary education, i.e., reform from the fourth grade upward in the 10-year general education above. 1/

1. Mathematics - In the 4th and 5th grades the curriculum incorporates along with arithmetic some elements of algebra and geometry, including a gradual introduction of elements of set theory and mathematical logic. In grades 6 through 8 pupils concentrate on algebra and geometry including each concepts a congruence, standard monomiads and linear equations, with logarithms in the 8th grade. The 9th and 10th grades are devoted to solid geometry, including vectors, various types of symmetry, coordinates and integrals. Some study of trigonometric functions is included.

1/ A series of Soviet articles on the reform, in general and by subject, appear in English translation in Soviet Education, Vol. XIX, No. 7 (May) and No. 8 (June) 1977 (N.Y : M.E. Sharpe, Inc.)

2. Biology - One of the subjects most needing reform and modernization, course content now includes botany (storage of energy, crossfertilization, chromosomes and cell division) in the 5th grade, zoology (taxonomy, anatomy and morphology) in the 6th and 7th grades, and general biology in the 9th and 10th grades, including the genetic basis of selection. (The Ukrainian 10-year curriculum in Table 2, does not yet reflect the shift of biology from the 8th to the 9th grade).
3. Chemistry - Pupils study inorganic chemistry in grades 7-9. The 7th grade includes atoms and molecules and the laws of preservation of mass and constant proportion, types of chemical reactions and their equations. 8th-graders study the periodic law and table chemical bonds, and the relation between classes of compounds. The 9th grade includes the theory of electrolytic dissociation, oxidation-reduction and ion-exchange reactions and the properties of hydroxides and hydrogen compounds. Organic chemistry (electronic concepts, chemical reactivity of substances), is taught in the 10th grade.
4. Physics - The 6th and 7th grades include molecular-kinetic, electronic and atomic theory. Grades 8 through 10 include the basic principles of the special theory of relativity, and introductions to Maxwell's treatise on electromagnetic waves and wave and quantum theory. Laboratory work is given a much more important role.
5. Russian or Native Language - 4th and 5th grades are concerned with development of vocabulary and oral expression, inflection of nouns, adjectives and verbs. Vocabulary and spelling continue in the 6th grade, and grades 7 and 8 are devoted to syntax.

6. Foreign Language and Literature - Traditionally the chief foreign languages are English, German and French. Foreign language and literature instruction reforms have been slower than other subjects and old curricula have not yet been changed substantially. In literature, the plan is to study the works of selected, individual authors in grades 4-7, and study the history of literature systematically in grades 8-10.

7. Geography - 4th grade is devoted to nature studies, (listed as a separate subject is the curriculums), 5th grade to elementary physical geography of continents, 7th to more advanced physical geography, 8th to economic geography of the U.S.S.R., and 9th to economic geography of foreign countries.

8. History - In grades 4 through 6, local history and early Russian history, the history of the ancient world and the middle age are studied. History of the U.S.S.R. is given consecutively from the 7th to 10th grades, and modern and contemporary history of foreign countries is studied along with that of the U.S.S.R. is the 8th through 10th grades. Such study includes the principles and classics of Marxism-Leninism and the leading role and documents of the Communist Party.

9. Social Science - This ideology course devoted to Marxist-Leninist tenets and the leading role of the Communist Party, now includes a separate unit entitled "Capitalism - the Last Exploitive System: From Capitalism to Socialism." A related course on "Fundamental Principles of Soviet Law and Government" was also introduced.

Major overall features of the 1970's curriculum content reform in general education include:

. raising the level of theoretical content of courses, teaching subject matter formerly at a higher grade level in lower grades, updating and introducing modern concepts and problems ranging from elements of the new mathematics and computers to ecology and environmental problems. One of the reform goals has been to each pupils to think more "independently," this appears to mean that rather the present system of teachers lecturing and pupils memorizing by rote and reciting when called upon, some freer discussion is now encouraged, as is creative solving of problems within the prescribed context and norms.

. maintenance and updating of the Communist ideological content in the various school subjects. Communist views are propagated in every subject, but are particularly prevalent in history, geography, literature, social science, and foreign languages. The new history course content continutes the teaching of the class struggle (so-called proletariat workers versus capitalist oppressors), Communist Party-mindedness, and the works of V.I. Leinin. In addition, it includes the documents of the latest Party Congress, the speeches of Party General Secretary L. I. Brezhnev, specific attributed features of modern imperialism, and the ideological struggle in the world at the present time. Geography includes economic geography in which foreign countries are studied on the basis of their social systems from a Communist point of view. Literature is used for

political indoctrination of pupils and shaping their national and world view in the Communist Party program and spirit. Social science is an indoctrination course, which has been described briefly as such above. Foreign languages and literature provide additional opportunity to present Western societies from a selective and generally derogatory frame of reference.

. elimination of duplicating textbook and other teaching materials in the same curriculum subject at different grades, by using the linear rather than the concentric approach to subject content. That is, with 10-year education or its equivalent now compulsory, subject matter can be taught systematically in sequence, rather than in one cycle at the elementary level (in grades 4-8) and then to some extent repeated in a more advanced cycle (in grades 9-10 (11). Also eliminated has been much needless or insignificant detailed and descriptive material within standard texts for each course.

At the same time, education reform leaders acknowledge that while much of the new content has been successfully mastered by pupils, serious problems remain where pupils do not grasp the material because of over-difficult textbooks, teachers who themselves have not mastered the material, and inadequate classroom and laboratory equipment, particularly in the rural areas where about half the pupils are taught.

Teacher Training

Teachers for general secondary schools are generally trained in pedagogical institutes (padagogicheskie instituty), in four or five year programs following 10 years of elementary-secondary education. In some cases, teachers

are graduates of universities (universitety). The level of education of teachers has steadily been upgraded over the years. In the 1970/71 school year, about 53 percent of those teaching in grades 1-10(11) of day schools of general education were reported to have completed a higher education. By 1977/78, 68 percent had completed higher education, music, art, (drawing), physical education and primary teachers being in the lower ends of the spectrum. The reported percentage having completed higher education is higher when restricted to gardes 4-10(11); over 80 percent for teachers of languages and literature, over 85 percent for history, geography, biology and mathematics teachers, and over 90 percent for physics, chemistry and foreign language teachers. Presumably, the percentages are lower for teachers of evening and other non-day programs.

In 1976 there were some 200 pedagogical institutes in the U.S.S.R. training teachers in the various languages and humanities, social and natural sciences, and drawing, music and physical education specialties for secondary education, as well as pedagogy and methods for primary and pre-school education. A specialty entitled "general technical disciplines and labor" is for teachers concerned with the vocational training component within schools of general education.

The 200 pedagogical institutes include 11 pedagogical institutes of foreign languages (pedagogicheske instituty inostrannykh iazykov), which train teachers primarily of English, German and French. Their foreign language program is more concentrated than that of the other pedagogical institutes, and they train interpreters as well as teachers.

Education Administration

The directing government agency for general secondary education is the U.S.R.R Ministry of Education, a relatively new national level education agency established in 1966. By regulations approved by the U.S.S.R. Council of Ministers in 1969, the U.S.S.R. Ministry of Education exercises authority over preschool, elementary and secondary general education, and the development of pedagogical sciences in the country.

The functions of the Ministry include: 1/

Participation in planning the development of general education in the country, including developing drafts of annual and projected plans and presenting them to the U.S.S.R. Council of Ministers and the U.S.S.R. State Planning Committee (Gosplan).

Developing and approving standard curriculums and syllabuses for schools of general education.

Organizing the training of teachers in educational institutions of the ministry's system, and developing curriculums for pedagogical institutes for approval by the U.S.S.R. Ministry of Higher and Secondary Specialized Education.

1/ M. G. Salischeva, et al, "O narodnom obrazovanii" (On National Education), Moscow: "Iuridischeskaia Literature" Publishers, 1974, pp. 27-29.

Organizing the utilization of audiovidual aids (movies, radio, television, etc.) in schools and pedagogical educational institutions;

Working out and approving standard regulations on schools;

Exercising control over the activity of all general education schools on questions of teaching-upbringing and methodological work;

Exercising leadership in teaching methods in the military preparation of senior graders in general education schools;

Publishing educational and methodological journals;

Awarding of medals, badges and honorary certificates to leading educational workers;

An administrative chain of government agencies leads downward from the national to the republic to the local level, controlling the general elementary-secondary schools of the country. In each of the 15 Soviet republics is an equivalent ministry to the U.S.S.R. Ministry of Education which directs the activities of local agencies (regional and city departments of education) and administers pedagogical institutes within the republic. Each republic ministry approves, within the scope of its competence, curriculums and syllabuses for such subjects as native language and culture of the area, and instructions in teaching methods.

The local departments of education attached to local government agencies called executive committees of councils of workers' deputies, exercise direct supervision of the schools of general education, monitoring (through school inspectors and a flow of official forms) that education laws, regulations, and objectives, such as compulsory education and adequate staffing and equipping of schools are carried out.

Education Research

Research on general secondary education is carried out in the U.S.S.R. Academy of Pedagogical Sciences and its research institutes and education research institutes in the various Soviet republics. Some of the U.S.S.R. Academy institutes most closely concerned with overall problems of regular general secondary education are entitled "Scientific Research Institute (SRI) for Content and Methods of Instruction," "SRI for General and Educational Psychology," "SRI for General Pedagogy," and "SRI for School Equipment and Technical Means of Instruction." There is a special institute for problems of the physically and mentally handicapped, the "SRI of Defectology." 1/

1/ For a detailed discussion of these and other research institutes of the Academy, see the author's Education in the U.S.S.R. Research and Innovation, HEW Pub. No. (OE) 77-19130, Washington: U.S. GPO, 1978.

Table 1. The 10-Year Curriculum of Russian General Secondary Schools

Subject	Number of hours per week by grade										Total number of hours per week
	1	2	3	4	5	6	7	8	9	10	
1. Russian language	12	10	10	6	6	3	3	2		2/0-	53
2. Literature	-	-	-	2	2	2	2	3	4	3	18
3. Mathematics	6	6	6	6	6	6	6	6	5	5	58
4. History	-	-	-	2	2	2	2	3	4	3	18
5. Fundamentals of the Soviet state structure and law	-	-	-	-	-	-	-	1	-	-	1
6. Social science	-	-	-	-	-	-	-	-	-	2	2
7. Nature study	-	2	2	2	-	-	-	-	-	-	6
8. Geography	-	-	-	-	2	3	2	2	2	-	11
9. Biology	-	-	-	-	2	2	2	2	0/2	2	11
10. Physics	-	-	-	-	-	2	2	3	4	5	16
11. Astronomy	-	-	-	-	-	-	-	-	-	1	1
12. Mechanical drawing	-	-	-	-	-	1	1	1	-	-	3
13. Chemistry	-	-	-	-	-	-	2	2	3	3	10
14. Foreign language	-	-	-	-	4	3	3	2	2	2	16
15. Fine art	1	1	1	1	1	1	-	-	-	-	6
16. Singing and music appreciation	1	1	1	1	1	1	1	-	-	-	7
17. Physical training	2	2	2	2	2	2	2	2	2	2	20
18. Workshop training	2	2	2	2	2	2	2	2	2	2	20
Total hours of compulsory subjects per week	24	24	24	24	30	30	30	31	30	30	277
19. Optional subjects	-	-	-	-	-	4	2	6	6	-	

Source: N. Kuzin and M. Kondakov (eds.), Education in the USSR. Moscow: Progress Publishers, 1977, p. 45. Double entries separated by a diagonal line indicate number of hours per week in the first and second half of the year, where they differ.

Table 2. The 10-Year Curriculum of Ukrainian General Secondary Schools

	Subject	Number of hours per week by grade									
		I	II	III	IV	V	VI	VII	VIII	IX	X
1.	Ukrainian language	12	8	7/8	6	4/3	3/4	2	2	-	-
2.	Ukrainian literature	-	-	-	-	2	2	2	3	4	4
3.	Russian language	-	4	5/4	5	3/4	3	2	2	-	-
4.	Russian literature	-	-	-	-	2	2	2	3	4	4
5.	Arithmetic	6	6	6	6	6	2	-	-	-	-
6.	Algebra	-	-	-	-	-	2	4/3	3	4	4
7.	Geometry	-	-	-	-	-	2	2/3	2	2	2
8.	History of the U.S.S.R. and the Ukrainian S.S.R.	-	-	-	2	2	2	3/2	3	4	3
9.	Social science	-	-	-	-	-	-	-	-	-	2
10.	Natural science	-	-	-	2	-	-	-	-	-	-
11.	Geography	-	-	-	-	2	2	2	3	2	-
12.	Biology	-	-	-	-	2	2	2	2	-	2
13.	Physics	-	-	-	-	-	2	2	3	5	5
14.	Astronomy	-	-	-	-	-	-	-	-	-	1
15.	Drawing	-	-	-	-	-	-	1	2	-	-
16.	Chemistry	-	-	-	-	-	-	2	2	4	3
17.	Foreign language	-	-	-	-	3	3/2	2/3	2	2	2
18.	Imitative arts	1	1	1	1	1	1	-	-	-	-
19.	Singing and music	1	1	1	1	1	1	1	-	-	-
20.	Physical education	2	2	2	2	2	2	2	2	2	2
21.	Vocational training	2	2	2	2	2	2	2	2	2	2
22.	Civil defense	-	-	-	-	-	-	-	-	1	-
	Total	24	24	24	27	32	33	33	36	36	36
23.	Pratical work (days in a year)	-	-	-	-	6	6	12	-	24	-
24.	Optional subjects	-	-	-	-	-	-	1	2	4	4

Source: A.M. Aleksuk et. al., Public Education in the Ukrainian S.S.R. Kiev: "Radyanska Shkola" Publishing House, 1970, p. 72 Double entries separated by a diagonal line indicate number of hours per week in the first and second half of the year, where they differ.

Table 3. The 11-Year Curriculum of Estonian General Secondary Schools

	Subject	The Number of hours per week by grade										
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI
1.	Native language	12	8	7	4	4	4	3	3	2	1	-
2.	Literature	-	-	-	2	2	2	2	2	3	4	4
3.	Russian	-	4	4	4	4	4	4	4	5	5	5
4.	Foreign language	-	-	-	-	4	3	3	2	2	2	2
5.	Mathematics	6	5	5	6	6	6	5	6	4	4/5	5/4
6.	Physics	-	-	-	-	-	-	2	2	4	5/4	3/4
7.	Chemistry	-	-	-	-	-	-	2	2	2	2	2
8.	History	-	-	-	2	2	2	2	3	2	2	3
9.	Social science	-	-	-	-	-	-	-	-	-	-	2
10.	Geography	-	-	-	-	2	3	2	2	2	-	-
11.	Biology	-	-	-	-	2	2	2	2	-	-/2	2
12.	Nature-study	-	2	2	2	-	-	-	-	-	-	-
13.	Astronomy	-	-	-	-	-	-	-	-	-	-	-/2
14.	Technical drawing	-	-	-	-	-	-	-	1/2	1	2/-	-
15.	Art	1	1	1	1	1	1	-	-	-	-	-
16.	Music	1	1	1	1	1	1	1	1	1	1	1
17.	Physical education	2	2	2	2	2	2	2	2	2	2	2
18.	Military instruction	-	-	-	-	-	-	-	-	-	2	2
19.	Manual training and domestic science	2	2	2	2	2	2	2	2/-	2	2	2/-
	Total	24	25	24	26	32	32	32	33	32	34	35
20.	Optional subjects	-	-	-	-	-	-	2	3	5	4	4

Source: R. Virkus, Education in the Estonian S.S.R. Tallinn: "Periodika" Publishers, 1975, p. 30. Double entries separated by a diagonal line indicate number of hours per week in the first and second half of the year, where they differ.

SECONDARY SPECIALIZED EDUCATION

Overview

The purpose of secondary specialized education in the U.S.S.R. is to train technicians or professional-support personnel in a wide range of specialties. These are primarily for the Soviet economy, industry and agriculture, but also in such fields as health, education and the arts. The objectives of secondary specialized schools are summarized in Article 36 of the fundamental law on education.1/

> The main tasks of secondary specialized education institutions are: Training of qualified specialists with secondary specialized and general secondary education, having the necessary theoretical knowledge and practical skills in a specialty, educated in the ideas of Marxism-Leninism. Constant perfection of the quality of training of specialists, according to the demands of modern production, science, technology, and culture, and the prospects for their development...

1/ Fundamentals..., op. cit., p.20

After grade 8, an alternative to continuing in grades 9-10 (11) of the schools of general education is for student to enter secondary specialized schools. The schools are free of tuition and most students receive a living stipend. Working students going part-time are given some paid and additional unpaid leave for laboratory work and examinations at the schools. Entrance to secondary specialized schools is by examination, in subjects appropriate to the speciality of the school, Russian (or the native) language and literature and mathematics. Graduates of the 10-year general education school may also be admitted to an abbreviated program, after passing the examinations in the same subjects at the 8-year school graduates plus history of the U.S.S.R. a science subject for certain groups of specialties.[1/] These standardized national examinations are approved by the U.S.S.R. Ministry of Higher and Secondary Specialized Education.

Applicants for full-time, day programs in secondary specialized schools are accepted up to the age of 30. There is no age restriction for study in evening programs or by correspondence-extension. The secondary specialized classroom, therefore will have a much broader spread of ages and a generally older age group than upper secondary grades 9-10 (11) of the school of general education.

1/ The subject matter of the various entrance examination is given each year in Spravochnik dlia postupaiushchikh v Srednie spetsiat'nye uchebnye zavedenia SSSR (Handbook for entrants to Secondary Specialized Educational Institutions of the U.S.S.R.), "Vysshaia Shkola" publishers, Moscow.

Specialty Fields of Study

Each secondary specialty field of study is officially designated by a 4-digit code number used for identifying the field of specialization, both in the training institution and in the industrial or other employing organization. (A similar system is used for higher education specialties). Some examples are:

0301 Electric power stations, networks and systems

0830 Technology of synthetic rubber

1911 Nursing

2001 Teaching in the primary classes of general education schools

2002 Pre-school education

2107 Music theory

Some specialties are taught at the secondary level in the U.S.S.R. which are at the higher education level in the United States, e.g. nursing and pre-school teaching. Others are taught in the U.S.S.R. at both the secondary level and the higher education level, e.g. teacher of primary grades, pharmacist, librarian and music specialist.

Specialty codes at the secondary specialized level parallel those at the higher education level, and some of the specialties have similar titles. For example, Specialty No. 0301, above, has the title "Electric Power Stations, Networks and Systems." At the higher education level, Specialty No. 0301 has the title "Electric Power Stations."

The distinction between the two is that the secondary specialty No. 0301 is taught in an uchilishche, and the graduate therefrom is a tekhnik-elektrik. The higher education specialty No. 0301 is taught in an institut, and the graduate is an inzhener-elektrik.

In the education field, despite discussion over the years of eliminating secondary specialized training of primary grade teachers and training all school teachers in higher education institutions, a sizable number continue to be trained each year at the secondary level. In the 1977/78 school year, the combined total of (primary and pre-school) teachers being trained in secondary specialized schools was about 410 thousand.

Total enrollments in 1977/78 in all secondary specialized schools was about 4.7 million, compared to 10.7 million in upper secondary general education (grades 9-10 and 9-11), and 5.0 million in higher education. Secondary specialized enrollments are mostly in engineering support and agricultural and economics fields. Highest enrollments (in thousands) by the Soviet grouping of specialties were agriculture (671), economics (640), machine building and instrument making (577), health and physical culture (437), construction (437) and education (410). Of the total enrollments, 60 percent of the students were studying in full-time day programs, 30 percent were studying by correspondence, and 10 percent were engaged in evening programs.1/

1/ Narodnoe khoziastvo SSSR v 1977g. pp. 495-497 (Moscow: USSR Central Statistical Administration, 1978.

Titles of Schools

Secondary specialized schools may generally be distinguished from higher education institutions by differences in titles. Listings of specific secondary specialized schools throughout the country appear by republic and oblast (region) in the annual Spravochnik, or official handbook published in Moscow (see Footnote). A similar annual handbook lists Soviet higher education institutions.

In general, higher education institutions are either a universitet or institut. Secondary specialized schools are either a tekhnikum or uchilishche. There is no term "college" in Soviet educational terminology, and transcript translations of "college" are sometimes erroneously applied to secondary specialized schools.

Examples of Russian titles of secondary schools in various fields and the specialties that are taught in them follow:

1) In the medical field: Meditsinskoe uchilishche - specialties: nursing, feldsher (physicians assistant), dental technician, pharmacy, midwifery.
2) In the education field: Pedagogicheskoe uchilishche - specialties: teaching in the primary grades of the general education school, pre-school teaching, music and drawing teaching, physical instruction.

3) In the economic and commercial fields: Tekhnikum (various types) - specialties: bookkeeping, managing cooperative trade, trade in consumer goods, budget accounting, computer work.

4) In the Transportation field: Tekhnikum or uchilishche (various types) - specialties: servicing and repair of automobiles, navigating internal water routes, railroad transport service.

5) In the industrial and construction fields: Tekhnikum or politekhnikum (various types) specialties - building, equipping and repairing industrial enterprises and machinery of various types, industrial production and metal working, chemical technology, and many other technical specialties.

6) In the cultural field: Uchilishche (various types) - specialties: library work, music theory and instruments art and sculpture, theater decorating and lighting, ballet and ensemble dancing, choral directing.

Course of Studies

In secondary specialized education, following eight grades of general schooling, the course of studies ranges from three to four years. It extends for three years in education, economic, commercial, and some medical specialties. It is 3½ years in other medical specialties, machine building and agriculture. Four-year specialties include mining, chemistry, metal working, music and the arts.

The subjects taught in the course of studies for each secondary specialty are grouped into three "cycles", or clusters of courses. The "general education cycle" includes such subjects as history of the U.S.S.R., literature, mathematics, physics, chemistry and foreign language. These are intended to meet the general education requirements for completion of secondary education, entitling the graduate to continue studies in higher education.

The second or "general technical cycle" provides basic technical subjects or the broader technical principles, for a related group of specialties. A technician in the specialization "Boilers," for example, would take technical drawing mechanics, technology of metals, basic electronics, and thermodynamics in this cycle.1/

The third, or "special technical cycle" of the curriculum provides the narrow, specific subjects of the specialty. In the boiler technician example these are such subjects as welded construction, loads and transport, steam boilers and installation, regulation and control of boilers, and technology of boiler construction.

1/ For a sample four-year curriculum of this secondary specialty provided for graduates of 8-year schools, see Hugh Warrens: Vocational and Technical Education (Paris: UNESCO, 1967) pp. 210-211 A two-year curriculum for 10-year school graduates is also given.

In the example given, 37 percent of the approximately 4000 hours in the total 4-year curriculum is spent on the general education cycle, 24 percent on the general technical cycle, and 33 percent in the special technical cycle. The remaining 6 percent is devoted to physical training.1/

The course of secondary specialized studies for graduates of 10-years (rather than 8-years) of general schooling is approximately half of the course for 8-year school graduates. The "general education cycle" is virtually eliminated, since 10-year school graduates have already taken the required subjects. The general technical cycle may also be somewhat reduced.

Emphasis for 10-year school graduates admitted to the reduced program at secondary specialized schools is on the narrow subjects of the field of specialization, in the special technical cycle. The goal is to provide these general secondary school graduates who did not go on to higher education with a marketable technical skill at the secondary specialized school.

1/ For another sample secondary specialized curriculum, that of the 3½ year course for feldsher (physician's assistant), see S.M. Rosen's Education in the U.S.S.R.: Research and Innovation (HEW Pub. No. 77-19130, Washington, U.S., GPO, 1978), p. 27.

Graduation and After

Upon completion of the course of studies, students at secondary specialized schools take state examinations, approved by the U.S.S.R. Ministry of Higher and Secondary Specialized Education, before graduating. The examinations include Russian (or native) language and literature and subjects related to the specialty, including some practical exercises in the specialty.

Graduates receive a diplom (diploma) indicating completion of secondary education and the title of the specialty. Students having a grade of "5" (excellent) in 75 percent or more of his school subjects, and "4" (very good) in the rest, plus a score of "5" in the final state examinations, receive a diplom s otlichiem (diploma with distinction).1/

Following completion of secondary specialized school, the great majority of graduates go to work in the Soviet economy. As is the case with graduates of higher education institutions, they generally are assigned to their first position and place of work. Many of them may already have been working and sent to the school by their plant, or they may have continued to work and give to the specialized school part-time. In these cases, they generally return or continue, respectively, in their original places of work.

1/ Biulleten' Ministerstva vysshego i srednego spetsial'nogo obrazovaniia SSSR (Bulletin of the U.S.S.R. Ministry of Higher and Secondary Specialized Education), Feb. 1978, pp. 2-7.

A small percentage, estimated at ten percent or less, presumably from among those who graduate with distinction from a secondary specialized school, continue on to higher education. They are likely to remain on their jobs while receiving a higher education in a related specialty part-time, through the correspondence-extension system or evening programs of higher studies.

Teacher Training

Teachers for secondary specialized schools are generally trained in pedagogical institutes for the general education courses, or in technical (engineering activities or other higher education institutions for the specialized subjects of the schools. While most engineers are not trained to be teachers, some engineering specialities combine both. For example the Specialty 0577 (the official code number of the higher education specialty) Machine Building, trains qualified engineers who are also teachers of the machine-building disciplines.

Education Administration

The directing government agency for secondary specialized education at the national level is the U.S.S.R. Ministry of Higher and Secondary Specialized Education. Concerned with the system for the development and training of highly skilled manpower or specialists raised in the spirit of Marxism-Leninism for the national economy, the ministry combines responsibility for specialist

training in higher education and technical education at the secondary level. Its functions related to secondary specialized education include:1/

a) Developing plans and indices for the training of technicians together with other interested ministries, in terms of the current and projected demands of various branches of the economy for technical manpower.

b) Developing the list of specialties by which training in secondary specialized schools is implemanted.

c) Approving curriculums and programs and preparing and publishing methodological literature for secondary specialized schools including approving and issuing programs for social science (communist ideology) courses.

d) Coordinating plans for and publishing textbooks and teaching aids, including organizing authors' competitions from which texts and aids are selected.

e) Supervising programs for raising qualifications of instructors, and conducting exchanges of students and instructors between Soviet and foreign schools.

1/ "Regulations on the Ministry of Higher and Secondary Specialized Education of the U.S.S.R.:. Soviet Education. Vol XII. No. 9-10-11. July-August-September 1970. pp. 138-145. and N.G. Salisheheva, et al. O narodnom obrazovanii (On Public Education). "Yuridicheskaia literatura" (Legal Literature Publishers). Moscow, 1974. pp. 30-31.

Below the national level are corresponding government ministries responsible for secondary specialized education in each of the 15 constitutent republics of the U.S.S.R. These exercise functions analogous to those of the U.S.S.R. Ministry of Higher and Secondary Specialized Education. They exercise instructional methods supervision over the secondary specialized schools which generally are directly subordinate to the industrial or other ministry for which the technicians are being trained.

For example, industrial technicums are directly under a republic Ministry of Local Industry, secondary medical schools are under a republic's Ministry of Health, and agricultural technicians are under a republic's Ministry of Agriculture. In some fields, such as construction and machine building, the schools are under the concerned national level, or U.S.S.R. Ministry. Regardless of which government agency they are under, the schools' academic programs are the responsibility of the U.S.S.R. or republic Ministry of Higher and Secondary Specialized Education.

Education Research

Research on problems of secondary specialized schools is carried out within a relatively new organization, the Scientific Research Institute on Problems of the Higher School, under the U.S.S.R. Ministry of Higher and Secondary Specialized Education. Founded in 1973, the Research Institute has 10 departments,

including one entitled "Problems of Secondary Specialized Education". It has two "sections" one for Development of Secondary Specialized Education, and one for "Scientific Organization of the Teaching Process."

VOCATIONAL EDUCATION

Overview

The purpose of vocational education in the U.S.S.R. is to train skilled workers in a wide range of fields for the Soviet economy, industry and agriculture. Article 31 of the fundamental law on education states:[1/]

> The main tasks of vocational-technical educational institutions are: Training for the national economy of well-rounded, technically educated and cultured young qualified workers who possess vocational skills answering the demands of current production, scientific-technical progress, and the prospects for their development; Implementation in secondary vocational-technical schools of vocational and general secondary education of youth; Giving pupils a Marxist-Leninist world view, educating them in high moral qualities, socialist internationalism, soviet patriotism, a communist attitude toward work and social property...

1/ Fundamentals..., op. cit., p. 19

The training is generally narrower, shorter and at a lower technical and theoretical level than secondary specialized education. Workers are trained in some 1100 trades for the metallurgical, chemical, construction, mining, petroleum, printing, agricultural and other fields.

Vocational training has traditionally been below the level of complete secondary education, but in recent years it has been divided into two major types: the traditional "vocational", extending from several months to two years, and the new "secondary vocational", extending for three years or more and providing completion of secondary education as well as training in a trade. For admission to vocational training, students must be 15 years of age or older and graduates of 8-year schools of general education (grades 1-8).

Traditional Vocational Schools

In the 1970's, enrollments have remained at around two million in the vocational or "vocational technical" schools, (professional'no-tekhnicheskie uchilishcha) confined to training for a trade, and not granting a secondary school diploma. They have dropped slightly, from 2.4 million in the 1970/71 school year to 2.0 million in 1977/78.

As may be seen in the sample 1-year and 2-year curriculum (Tables 3 and 4), the two main segments of each program are courses in the subject matter of the trade and a large amount of industrial training (called "production instruction" or "production practice"). Two political socialization courses are included (political economy or social science and problems of Soviet law), and physical education.

Pupils who have graduated from vocational schools are issued a certificate (attestat) indicating their vocational specialty or trade. They usually go directly to work, but they may take examinations for and enroll in secondary specialized schools.

Secondary Vocational Schools

In contrast to the gradually dropping vocational school enrollments in the 1970's, during the same period there has been a dramatic rise of enrollments in secondary vocational or "vocational-technical" schools (srednie professional'no-tekhnicheskie uchilishcha). In the 1970/71 school year enrollments were only 180,000 in a total of 615 secondary vocational schools in the country. By 1977/78 enrollments had grown to 3.4 million, and the number of schools to 3418.

These figures reflect Soviet state policy, which acknowledges the need for increasingly combining general education with vocational training at the skilled worker as well as the technician level, to provide more broadly educated personnel overall for the complexities of modernized industry. Decrees of the Communist Party

and Soviet Government in April 1969 established the goal of gradually transforming vocational schools into secondary vocational schools. The statistics indicate that this objective is being implemented.

A sample of a 3-year secondary vocational school curriculum is given in Table 5 . It has two cycles or clusters of courses, vocational-technical and general education. The latter is similar to the general education cycle of secondary specialized schools, including courses required for completion of secondary education totalling about 1500 hours. These include Russian or native language and literature, and the social and physical sciences. Unlike secondary general and secondary specialized education, however, a foreign language requirement is not included, although it may be provided optionally as an elective.

The general-technical cycle provides the vocational subject matter in classroom and shop studies needed to master the given trade. In addition, there is a substantial amount of industrial training at adjoining or nearby plants which may total half the curriculum time.

Graduates of 10-year schools of general education may also take vocational training in reduced programs (minus the general education cycle), involving 1 year to 1½ years of vocational training.

Students who graduate from secondary vocational schools generally go directly to work in their trade. They may apply for admission to higher education, but presumably very few have been admitted compared to graduates of secondary general and specialized schools.

Graduates of the full program of secondary vocational schools receive a diploma (diplom) noting the completion of general secondary education as well as their vocational specialty or trade. Graduates of the reduced program, i.e. enrollees who previously were graduates of 10-year schools, receive a certificate (attestat) noting their vocational specialty.

As a general practice, graduates of the various types of vocational schools are sent to work at the industrial (or other) enterprises where they performed their industrial training.

Teacher Training

Teachers for the secondary vocational schools have various backgrounds. Those who teach general education subjects are generally trained at pedagogical institutes, which are teachers colleges. Teachers of vocational subjects range from graduates of engineering schools, called technical institutes, to graduates of tekhnikumi, or secondary specialized schools, who are "masters of production instruction."

There are about 70 of such tekhnikumi in the country for preparing teachers of vocational subjects, and they are jurisdictionally under the USSR State Committee for Vocational-Technical Education. An example is the Ural's city of Sverdlovsk's Industrial-Pedagogical Technicum (Sverdlovskii industrial'no-pedagogicheskii tekhnikum), which offers specialties in metal working, repair of industrial equipment, electrical equipment of industrial enterprises, and the technology of welding. The tekhnikum provides correspondence-extension as well as regular day courses of instruction.

Vocational Education Administration

The directing government agency for vocational education at the national level is the State Committee for Vocational-Technical Education of the U.S.S.R. Council of Ministers. In 1958 this agency and the present day vocational system succeeded the State Labor Reserve Administration and the national draft system of state labor reserves established in 1940.1/

The State Committee implements a unified national policy for vocational education. Together with the State Agency on Questions

1/ For a discussion of the earlier State Labor Reserve system, see Nicholas De Witt's Education and Professional Employment in the U.S.S.R. (National Science Foundation MSF 61-40, Washington: U.S. GPO, 1961) pp. 157-159.

of Labor and Wages, and with some input by the trade unions, the State Committee works out the official lists of trades in which vocational training is given. Its functions include:

a) planning training of skilled workers in vocational schools and the subsequent placement of graduates, developing annual and long-range plans,

b) approving rules of admission and the length of studies in the school system,

c) directing organization of the schools and developing curriculums and educational programs for them,

d) planning and organizing preparation of textbooks and teaching methods of literature for vocational education,

e) carrying out inspections of vocational-technical agencies and educational institutions,

f) organizing training and upgrading of teaching personnel in vocational education,

g) defining the direction of research in problems of vocational education.

To carry out these functions the State Committee has divisions, by major industries, an Academic Council, a State Inspectorate, and an All-Union Institute for Upgrading Qualifications. Below the national level, there are corresponding State Committees

for Vocational-Technical Education in each of the 15 Soviet republics. These direct Administrations of Vocational-Technical Education in each region (oblast) or territory (krai) which are directly responsible for the vocational schools.

Every vocational school is attached to a sponsoring industrial or agricultural enterprise, which is required to provide the school free of charge the equipment, materials and tools necessary for student instruction, and assist the school in maintenance and cultural services. The sponsoring plants or collective forms provide the sites of industrial or agricultural practice for vocational students, acquainting them with labor methods and machinery. Sponsors are responsible for student safety, work clothing, food, and appropriat training in accordance with the educational program.[1/]

Vocational Education Research

Research on problems of vocational education are carried out in the U.S.S.R. Academy of Pedagogical Sciences, attached to the U.S.S.R. Ministry of Education. The responsible division of the Academy is entitled "Pedagogy and Psychology of Vocational-Technical Education," and it has under it a Scientific Research Institute for Labor Training and Vocational Guidance.

1/ Primary Sources of this section are:

a) I.G. Kovalenko, Professional'no-tekhnicheskoe obrazovanie v SSSR (Vocational-Technical Education in the U.S.S.R.), Moscow: "Vysshala Shkola" Publishers, 1974.

b) N.G. Salishcheva, E.M. Koveshnikov, and L.A. Smeshenko, O Narodnom Obrazovanii (On National Education). Moscow: "Iuridicheskaia literatura" Publishers, 1974.

Table 3. Sample 1-Year Curriculum in Vocational Schools: Course for Equipment Repair Mechanic

Subjects	Academic Weeks			Total Hours of Instruction
	13	14	16	
	Hours per Week			
1. Industrial Training	18	21	41	11
2. Specialized Technology	6	5	-	1.0
3. Tolerances and Technical Measurement	1	2	-	39
4. Materials and Technology of Machine Building	3	4	-	95
5. Reading Diagrams	2	2	-	54
6. Political Economy	3	2	-	69
7. Problems of Soviet Law	1	1		25
8. Physical Education	2	2	-	54
Consultations				40
Examinations				18
Total	36	39	41	1728

Source: Uchebnyi plan i programmy, professiia-slesar'-remontnik (Curriculum and Syllabus, vocation-equipment repair mechanic). Pamphlet issued by State Committee for Vocational-Technical Education of U.S.S.R. Council of Ministers. Moscow: "Vysshaia Shkola" Publishers, 1975, p. 7.

Table 4. Sample 2-Year Curriculum in Vocational Schools: Course for Underground Equipment Machinist

	Subjects	First Year Academic Weeks 17	43	3	Second Year Academic Weeks 16	26	Total Hours of Instruction
		Hours per Week			Hours per Week		
1.	Industrial Training	18	18	36	18	36	2034
2.	Special Technology	4	5	-	4	-	244
3.	Safety Techniques	-	-	-	4	-	64
4.	Fundamentals of Mining	2	2	-	-	-	78
5.	Mining Electrotechnics with Fundamentals of Electronics	2	2	-	2	-	110
6.	Fundamentals of Labor Economics and Production	-	-	-	2	-	30
7.	Management of Materials	2	1	-	-	-	56
8.	Technical Drawing	2	2	-	-	-	78
9.	Social Science	2	2	-	2	-	110
10.	Problems of Soviet Law	1	-	-	-	-	25
11.	Basic Military Training	2	3	-	3	-	140
12.	Physical Education	2	2	-	2	-	110
	Consultations						75
	Examinations						30
	Total	37	37	36	37	36	3184

Source: Uchebnyi plan i programmy, professiia - mashinist podzemnykh ustanovok (Curriculum and Syllabus, vocation-underground equipment machinist). Pamphlet issued by State Committee for Vocational-Technical Education of U.S.S.R. Council of Ministers. Moscow, 1975, pp. 12-13.

Table 5. Sample 3-Year Curriculum of Secondary Vocational Schools: Course for Ratio Mechanics

Cycles	First Year Hours	Second Year Hours	Third Year Hours	Total Hours
A. Vocational-Technical Cycle				
1. Industrial Training	576	576	960	2112
2. General-Technical	273	407	182	862
Total	849	983	1142	2974
B. General-Education Cycle				
1. Russian Language and Literature	78	100	54	232
2. Mathematics	156	134	60	350
3. History	100	100	44	244
4. Social Sciences	-	22	48	70
5. Geography	39	-	-	39
6. Biology	-	-	44	44
7. Physics	173	78	64	315
8. Astronomy	-	-	20	20
9. Chemistry	117	95	-	212
Cycle Total	663	529	334	1526
Total of 2 Cycles	1512	1512	1476	4500

Source: I.G. Kovalenko, Professional'no-Tekhnicheskoe Obrazovanie v S.S.S.R. (Vocational-Technical Education in the U.S.S.R.) Moscow: "Vysshaia Shkola" Publishers, 1974, pp. 19-20.

FINAL EXAMINATIONS IN SECONDARY SCHOOLS

During June of each year, Soviet students have completed the regular secondary school program, that is, those who have completed grades 1 to 10 or its equivalent are required to take a final school-leaving examination in most of the major subjects which they have studied during secondary education. These examinations have been compulsory for all graduating students in the USSR since June 1944, when the Soviet Government issued a decree, On Measures for Improving the Quality of Instruction in the Schools. This decree called for the present examination system to be applied throughout the federal union. The examinations are made up by the ministries of education in the various Soviet republics, and are submitted by them to the individual district school authorities.

Although the actual number of subjects and the kinds of questions have varied over the years, the type, form, and purpose of the examinations have been relatively constant. The examination pamplets are published annually by the State Publishing House a few months before examination time. The principal aims of these final tests are to verify the amount of knowledge acquired by the 10-year students upon completion of their secondary education, and to reveal "their development, independence of judgment, and ability to relate knowledge with life-theory with practice."

Pupils are expected to master the prescribed body of knowledge from lectures, textbooks, other required study materials and laboratory and practical work. They are expected to meet the officially set achievement levels, as tested in the questions and problems of the final examinations.

According to Kuzin/Kondakov:1/

> The Ministry of Education of the given Union Republic determines the topics and problems for the written tests and the qeustions to be asked at the oral examinations. These are put in sealed envelopes which are opened immediately before the examinations.
>
> The pupils know the questions for the oral tests beforehand, as they are published in booklet form in a large printings. However, they do not know the problems that are to be included in the oral questions and which are decided upon by the teacher of each given subject, to be approved by the school principal.
>
> In the national schools of the Union and Autonomous Republics and in the Autonomous Regions of the RSFSR where classes are conducted in the pupils' native tongue, there are additional examinations, both written and oral, in the native language and literature.

1/ M. Kuzin and M. Kondakov, op. cit., pp. 67-68.

The students appear before an examination board at the school, consisting of the school director or principal, the teacher of the given subject, two or three "assistants" (who may include other teachers of the subject or a teacher from a higher education institution), and a representative from the district department of education.

The examination procedure is for each pupil, upon call, to go to the front of the room and to select from a basket one card, or ticket, bearing the questions which the pupil will answer. After he/she has had time to examine the ticket and reflect on the problems, the pupil is asked to provide the answers orally and, when appropriate, on the blackboard. Answers are judged by the examination board of the school, which gives a numerical grade for each subject on which the student is examined. The grade which the pupil receives may range from 5 (the highest mark) to 1 (the lowest); a grade of 3 is passing, and anything lower is not passing. Pupils who receive 5 in all examinations as well as in their other subjects are awarded gold medals; those who make 5 in the final examinations but have three or less 4's in other subjects receive silver medals. Pupils successfully completing the 10-year program, including examinations, receive the certificate of maturity or a diploma, representing graduation, respectively, from a school of general education or a vocational/specialized secondary school.

A summary comparison follows of the scope and basic content of sample examination pamphlets of the 1950's (1958), the 1960's (1964) and the 1970's (1979), alphabetically by subject:

Algebra-21 questions (each with three parts) given in 1958 and also in 1964. One question less in 1979, this examination aims to test the pupil's knowledge of basic concepts, rules, and theorems in algebra and his ability to understand and apply theorems in solving problems. Examination subject for evening and correspondence schools only in 1979. Includes geometry and trigonometry questions.

Chemistry-31 questions (each with two parts) in 1958; 25 and 24 questions (each with three parts) in 1964 and 1979, respectively. Pupils were tested on their understanding of basic chemical substances and their transformations; ability to formulate chemical equality in reactions, and to make analyses of them; Butlerov's theories of chemical structures; the periodic law of Mendeleev; ability to perform uncomplicated experimental problems; and uses of chemical substances in the economy.

Foreign Languages - In 1958, there were three separate examination pamphlets, with 23 questions for the English language, 26 for German, and 25 for French - all having

two parts each. For example, on the English language, the question might read:

a. Reading and translation of an unfamiliar text with a dictionary. Answers to questions relating to the text read.

b. Find in the text verbs in the past perfect; explain the necessity of using past perfect in the given text.

(Questions for the French and German languages followed a similar pattern.) However, in 1964 and 1979 a single set of questions was used, entitled Foreign Languages (English, German, and French). There were 20 questions, each having two parts, as follows:

a. Report or discussion on a subject, with specific themes named in 1964 but not in 1979 apparently now allowing the examination committee more discretion.

b. Reading and translation of an unfamiliar text with dictionary, or Reading of an unfamiliar text without a dictionary and answers to questions relating to text read.

Geometry-26 questions (each with three parts) in 1958 and 23 questions (each with three parts) in 1964. The aims are identical to those mentioned for algebra, but as they apply to geometry. omitted as a separate subject on examination pamplet in 1979, but some geometry questions included in algebra examination.

History of the USSR and Social Science - In 1958 there were 30 questions (each with two parts) and the examination was entitled History of the USSR. In 1964 there were 39 questions and in 1979 there were 37 questions (each with two parts): the first part on the history of the USSR and the second on social sciences. As in 1958 and in 1964, so in 1979, pupils were tested on their knowledge of the most important national events, their significance and consequences; historical leaders such as Marx, Engels, and Lenin; and the leading role of the USSR in history. In addition, in 1964, and 1979 they were asked about the more recent communist party congresses and programs and the leading role of the communist party in society. To the usual questions about capitalist exploitation and the class struggle, "the need to fight against alien customs and traditions" was added in 1979.

Literature - Omitted in examination pamphlets of 1958 and 1964. In 1979 there were 27 questions (each with two parts). Pupils are tested not only on their knowledge of leading literary figures and works of literature, but also on the Communist Party's directives on the role of literature and the Communist Party content of literature.

Physics - 32 questions (each with two parts) in 1958 and 25 and 28 questions, respectively (each with three parts) in 1964 and 1979. The aim are to test knowledge of basic concepts and application of laws of electricity, optics, atomic structure, and certain problems of mechanics; the principles of oscillation and heat; ability to explain physical phenomena on the basis of theories and to confirm physical laws by examples, and ability to do experiments.

APPENDIX: Text of General Instructions and Questions for Secondary School Final Examinations

The text which follows is a translation of the Russian pamphlet Bilety dlia vypusknykh ekzamenov za kurs srednei shkoly na 1979/80 uchebnyi god (Final Examination Questions for the Secondary School for the 1979/80 School Year). The pamphlet was issued by the Program-Methods Administration of the Ministry of Education of the Russian Soviet Federated Socialist Republic (the largest of the 15 republics of the U.S.S.R.). It was published in Moscow in 1980 by the Prosveshchenie Publishing House. (For comment and a comparison of the 1979/80 examination with sample examinations of the 1950's and 1960's, see page).

General Instructions

Oral examinations for the secondary school course are conducted in day general educational schools for literature (except non-Russian schools), USSR history and social sciences, physics, chemistry and foreign languages. In evening (shift) and correspondence schools oral examinations are conducted on USSR history and social science, algebra and elementary functions, physics and chemistry.

The questions on literature are in keeping with program requirements. The content of the questions embraces all of the material from the course in Soviet literature (grade X) and also

the main issues in the course on classical Russian literature (grades VIII-IX).

The questions on USSR history and social sciences are written in such a way that the first question is given on USSR history and the second on social sciences. In the examination on USSR history and social sciences the students are permitted to use charts, tables and statistical reference books that do not contain a complete text. The examination ratings on USSR history and social sciences are entered individually in the examination report.

When conducting examinations on physics and chemistry special attention should be drawn to the students' understanding of the materiality of the world, its unity, the interconnection and mutual conditioning of natural phenomena and also materialistic teachings about the knowability of the world and the objective laws of its development.

The questions on physics and chemistry require the examinees to perform laboratory work and experiments and to solve calculation and calculation-experimental problems. In individual cases it is necessary to make calculations in connections with experiments that are being demonstrated and laboratory work. If the school does not have the necessary substances and instruments for laboratory work indicated in the questions on physics and chemistry, the experiments can be replaced by analogous activity. The examinees perform laboratory work during the time of preparation for the answer and during the time of the answer they report on the course and results

of the work with an explanation, if necessary, of the corresponding theoretical questions, but with a mandatory demonstration of the equipment utilized for the laboratory work.

The questions on physics and chemistry indicate only the types of experiments and problems. The teacher of these subjects themselves write them or select them from the appropriate books of problems.

The questions should include problems whose solution makes it possible to verify the students' ability to apply theoretical knowledge intelligently.

The examinations in English, German, French and Spanish are conducted from the same questions.

In the foreign language examinations one tests for the students' practical mastery of oral speech in the foreign language and the ability to read a foreign text with full understanding, either with or without a dictionary.

Pronunciation skills and the student's mastery of lexical and grammatical material are revealed in the process of oral communication on a given subject and also in the process of reading and presenting the content of the text.

In the first part of the question the student is to report orally on one of the subjects developed by the RSFSR Ministry of Education. Each subject has a number that corresponds to a number in the question. It is given to the student after he has selected the question.

When preparing an answer the student is permitted to use a Russian-foreign language dictionary and to make the necessary notes in the foreign language (report outline, individual words and expressions).

The student's answer to the first question should be like a completed report on a given subject; the approximately length should be no less than ten sentences. If the student has difficulty doing the report independently the teacher has the right to give him a number of subsequent questions which stimulate the student possibly to make a full statement on

the given subject. If the student's answers exhaust the subject the grade for the answer is not lowered.

The second part of the questions is given in two variants. One variant is to test the ability to understand the content of a text that is read using a dictionary. When answering the student gives the content of what he has read in the foreign (or Russian) language. The teacher can, at his discretion, ask him to read part of the text aloud and translate one sentence for another.

On the questions of the second variant one tests the ability to understand the main content of a text read without a dictionary. The student gives in the foreign language the main content of what he has read. If necessary the teacher can ask him additional questions on the content. The teacher writes the questions about the texts ahead of time.

The teacher selects the texts for reading from various sources: newspapers and magazines in foreign languages, books for reading. They should be excerpts that are complete in meaning (with a volume of no more than 650 letters) and in terms of difficulty they should correspond to the requirements of the program for the secondary school course. When selecting texts for reading without a dictionary individual words and expressions which, in the opinion of the teacher, can cause the student difficulty in understanding the content, should be given with the translation in footnotes or entered on a separate sheet and appended to the text.

The questions on algebra and elementary analysis for evening (shift) correspondence schools which are published in an appendix to this collection, along with theoretical questions, include problems and examples selected or drawn up by the teacher.

Questions on Literature

Question No 1

1. The 24th and 25th CPSU Congresses on the role of literature and art in communist education of workers.

2. The freedom-loving lyrics of A. S. Pushkin. Recite one of the poems.

Question No 2

1. The Leninist principle of party content in literature. The article by V. I. Lenin, "Party Organization and Party Literature."

2. The fundamental themes of the lyrics of M. Iu. Lermontov. Recite one of the poems.

Question No 3

1. The life and creative path of A. M. Gor'kiy. Gor'kiy—founder of Soviet literature.

2. A. S. Pushkin on the task of the poet in poetry. The national creativity of Pushkin.

Question No 4

1. The early revolutionary-romantic works of A. M. Gor'kiy, their ideological trend and artistic originality.

2. Evgeniy Bazarov and Pavel Petrovich Kirsanov in the novel of I. S. Turgenev, Fathers and Sons. Pisarev on Bazarov.

Question No 5

1. Humanism of A.M. Gor'kiy's poem "On the Day."

2. Chatskiy and Molchanin in the comedy of A. S. Griboedov "Woe from Wit."

Question No 6

1. Cor'kiy's novel "Mother" as a work of socialist realism,

2. The problem of national happiness in the poem of N, A, Nekrasov "Who Can Live Well in Russia." Recite a passage from the poem.

Question No 7

1. Pavel Vlasov—the first model of the worker-revolutionary in the history of world literature.

2. "Lay of the Host of Igor"—the greatest monument of ancient Russian literature, Karl Marx onthe basic idea of the "Lay."

Question No 8

1. The life path of Nilovna. The significance of the image of Nilovna in revealing the ideological meaning of the novel Mother.

2. Civic spirit and national feeling of N. A. Nekrasov. V. I. Lenin on the creatitivy of Nekrasov. Recite one of the poet's poems.

Question No 9

1. The figure of the leader of the proletariat in A. M. Gork'kiy's essay "V. I. Lenin."

2. Typical characters in N. V. Gogol's poem "Dead Souls," using one of the chapters indicated by the teacher as an example.

Question No 10

1. The theme of revolution in A. A. Blok's poem "Twelve."

2. The civic accomplishment of N. G. Chernyshevskiy.

Question No 11

1. Theme of the native land in the poetry of S.A, Esenin. Recite one of the poems.

2. Individualistic rebellion of Raskolnikov against the inhumanity of burgeois society; the profound contradiction of this protest.

Question No 12

1. V. V. Mayakovskiy on "The Poet's Place in the Worker Structure," Recite an excerpt from the introduction to the poem "A Voice in Everything."

2. The strength of character of Katerina and the tragic poignancy of her conflict with the "dark tsardom" in A. N. Ostrovskiy's drama "Thunderstorm." The image of Katerina in N. A. Dobrolyubov's evaluation.

Question No 13

1. Satirical works of V. V. Mayakovskiy. Lenin's evaluation of the poem "Meeting Addicts."

2. Moral problems of the novel of M. Iu Lermontov A Hero of Our Time.

Question No 14

1. The theme of revolution and Soviet patriotism in the lyrics of V. V. Mayakovskiy.

2. The life quest of the main heroes of L. N. Tolstoy's novel War and Peace.

Question No 15

1. Lenin and the Party in V. V. Mayakovskiy's poem "Vladimir Il'ich Lenin."

2. True patriotism and heroism in the understanding of L. N. Tolstoy (in the novel War and Peace).

Question No 16

1. V. V. Mayakovskiy's poem "Good," The ideological wealth and artistic originality of the poem.

2. The popular General Kutuzov in L. N. Tolstoy's War and Peace.

Question No 17

1. Pavel Korchagin and his heroic generation in N. A. Ostrovskiy's novel How the Steel was Tempered.

2. V. I. Lenin on L. N. Tolstoy.

Question No 18

1. The formation of the new man in the revolution, by example of the fate of the hero of A. A. Fadeyev's novel The Rout.

2. Depiction of the revolutionary-fighter in the lyrics of N. A. Nekrasov.

Question No 19

1. The depiction of beauty of the soul and force of character of the Soviet man—the fighter and worker in M. A. Sholokhov's story "Fate of Man."

2. A. S. Pushkin's novel Evgeniy Onegin as "an encyclopedia of Russian life and at a higher level a national production" (V. G. Belinskiy).

Question No 20

1. The leading role of the Party in socialist transformation of the countryside in M. A. Sholokhov's novel Virgin Soil Upturned. Depiction of the exploits of communists in the novel.

2. The theme of love and friendship in A. S. Pushkin's lyric. The concept of the lyrical work. Recite one of the poems.

Question No 21

1. The path of the working peasantry to socialism in M. A. Sholokhov's novel Virgin Soil.

2. Depiction of the national character of the War of 1812 in L. N. Tolstoy's novel War and Peace, using one of the episodes indicated by the teacher as an example.

Question No 22

1. The glorification and poeticization of the labor exploits of the Soviet people in A. T. Tvardovskiy's poem "Such a Long Way."

2. Problematics and heroes of A. P. Chekhov's play The Cherry Orchard.

Question No 23

1. Depiction of the Soviet nation in the Great Fatherland War, using one or two works of contemporary Soviet literature as examples.

2. The embodiment of self-satisfied mediocrity and philistinism in the works of A. P. Chekhov. Chekhovian figures in the works of V. I. Lenin.

Question No 24

1. Theme of the labor heroism of the Soviet people in works of Soviet literature of the 1950's-1970's, using one or two works as examples.

2. Tales of M. E. Saltykov-Shchedrin "The Wise Gudgeon" and "The Barbarous Landowner." Utilization of the device of allegory and forms of national tales in the creativity of the writer.

Question No 25

1. The Leninist theme in Soviet literature of the 1950's-1970's, using one or two works as examples.

2. Dream of creative work as the basis of a just and honorable life in the works of A. P. Chekhov.

Question No 26

1. Socialist realism- the fundamental artistic method of Soviet literature.

2. The "Special Person" Rakhmetov in N. G. Chernyshevskiy's novel What is to be Done? V. I. Lenin on the novel.

Question No 27

1. Moral make-up of the Komsomol [Communist Youth Organization] member in the Soviet literature of the 1950's-1970's.

2. Critical depiction of high society and the upper bureaucracy in L. N. Tolstoy's novel War and Peace.

Questions on [USSR] History and Social Sciences

Question No 1

1. V. I. Lenin's struggle for creating a Marxist proletarian party in Russia in 1900-1903. The second congress of the RSDRP [Russian Social-Democratic Workers' Party]; its historical significance.

2. Labor relations under socialism; their essential difference from capitalist labor relations.

Question No 2

1. The causes and the basis of the first revolution in Russia. The third congress of the RSDRP [Russian Social Democratic Workers Party] concerning the nature, motive forces and prospects of the revolution.

2. Acceptance of the new USSR Constitution--the Fundamental Law of development of socialist society; its global historic significance

Question No 3

1. The all-Russian October strike. The December armed uprising. V. I. Lenin on the causes of the outbreak and the historical significance of the revolution of 1905-1907 ("Report on the 1905 revolution").

2. The world system of socialism--a new type of economic and political relations among states, a leading revolutionary force in the modern age.

Question No 4

1. The agrarian reform of tsarism. V. I. Lenin on the reasons for its failure.

2. The main rights and responsibilities of USSR citizens. The unity of rights and responsibilities of Soviet citizens. Protection of the homeland—the sacred duty of each USSR citizen.

Question No 5

1. The new upsurge of the revolutionary movement in Russia (1910-1914). The Bolshevists heading the revolutionary struggle of the masses.

2. The basis of the economic system of the USSR. Forms of socialist property in the USSR.

Question No 6

1. The influence of the first world war on the economic and political situation in Russia. V. I. Lenin's struggle against social chauvinism and for the transformation of the imperialist war into a civil one ("On the National Pride of the Great Russians").

2. Labor and distribution under socialism. The path of the change-over to a communist principle of labor and distribution.

Question No 7

1. The February bourgeois-democratic revolution in Russia. Diarchy. V. I. Lenin on the class essence of diarchy ("On Diarchy").

2. The social structure of the Soviet society. Paths to construction of a classless communist society.

Question No 8

1. Historical preconditions for the socialist revolution in Russia.

Lenin's plan for changing over from a bourgeois-democratic revolution to a socialist revolution ("On the Tasks of the Proletariat in this Revolution").

2. Soviet law and order. Socialist law in the USSR.

Question No 9

1. The sixth party congress and its significance. The exacerbation of the general revolutionary crisis in Russia.

2. The Leninist principle of peaceful coexistence. The 25th CPSU Congress on the tasks for further struggle for implementation of the Program of Peace. The USSR Constitution on the basic goals and principles of foreign policy of the Soviet state.

Question No 10

1. Lenin's plan for armed uprising ("Marxism and Uprising"). The victory of the armed uprising in Petrograd. The second congress of soviets.

2. The basic economic law of socialism. Planned proportional development of the USSR economy—a unified national economic complex; essential advantages of the socialist national economy over the capitalist economy.

Question No 11

1. The triumphal procession of Soviet power. "The declaration of the rights of the people of Russia." The worldwide historical significance of the Great October Socialist Revolution—the main event of the 20th century.

2. The 24th and 25th CPSU Congresses on the combination of the achievements of the scientific and technical revolution with the advantages of socialism.

Question No 12

1. The construction of the soviet state. The basis of socialist transformation in the country. V. I. Lenin—the founder and the leader of the first socialist state in the world.

2. The peculiarities of the workers' movement in the modern stage. The world communist movement—the most influential political force of our time.

Question No 13

1. V. I. Lenin's struggle for the revolutionary withdrawal of Soviet Russia from the war. "The Socialist Homeland in Danger!" The Brest peace.

2. Commodity and monetary relations under socialism (the role of the law of value and money under socialism).

Question No 14

1. The causes of the civil war and foreign intervention. The Soviet republic in the circle of fronts in 1918. V. I. Lenin leading the defense of the socialist homeland.

2. Socialist expanded reproduction. National income and the stage budget in the USSR.

Question No 15

The 8th party congress and its significance. The policy of military communism. The first communist Saturdays.

2. The collapse of the colonial system of imperialism. The development of the national liberation movement in the modern stage.

Question No 16

1. The rout of the White Guard troops of Kolchak and Denikin. Mass heroism of the Soviet people in the fight against interventionists and White Guardsmen.

2. The CPSU program adopted by the 22nd party congress concerning the main tasks of communist construction. Characteristic features of the development of socialist society, its place in the historical process of the formation of communism.

Question No 17

1. The rout of the troops of the bourgeois landowners of Poland and Vrangel'.

2. The formation of the new man—one of the major tasks in communist construction. The main features of communist morality. The need to fight against alien customs and traditions.

Question No 18

1. The joint struggle of workers of all nations of Russia against interventionists and White Guardsmen. The causes and historic significance of the victory of the Soviet people in the civil war.

2. The political base of the USSR. Agencies of state power and state administration in the USSR. The democratic nature of their formation and activity.

Question No 19

1. The international and domestic position of the soviet country after the civil war. Lenin's plan for electrification and its historical significance.

2. The main question of philosophy. The party nature of philosophy.

Question No 20

1. The 10th party congress. The changeover to a new economic policy. The essence and significance of NEP.

2. The historic preconditions for the origin and development of Marxism. The constituent parts of Marxism-Leninism; its revolutionary transforming role.

Question No 21

1. The preconditions and worldwide historic significance of the transformation of the USSR.

2. Capitalist commercial production (commodity, value).

Question No 22

1. Lenin's plan for the construction of socialism; its essence and historical significance.

2. Money. The law of value under capitalism.

Question No 23

1. The 14th party congress; the course toward socialist industrialization. The ideological defeat of the Trotsky-Zinov'ev antiparty block.

2. The essence of an exploitative state; its historical types and forms. The essential differences between the socialist and bourgeoise states.

Question No 24

1. The 15th party congress; the course toward collectivization of agriculture. The ideological defeat of the right wing.

2. The essence of capitalist exploitation. The aggravation of social antagonisms in modern capitalism.

Question No 25

1. Lenin's program for cultural revolution and its implementation during the years of the prewar five-year plans.

2. The Soviet socialist state; its essence and functions. Social organizations in the USSR. Further development of socialist statesmanship and democracy during the period of communist construction.

Question No 26

1. The victory of socialism in the USSR. The USSR Constitution of of 1936 and its historical significance.

2. Imperialism--the highest and last stage of capitalism. The peculiarities of imperialism under modern conditions. The crisis of bourgeoise ideology.

Question No 27

1. The USSR struggle for peace and collective security. Expansion of the fraternal family of soviet nations. The USSR economy and strengthening the country's defense might on the eve of the Great Patriotic War.

2. The CPSU—the leading and directive force of soviet society, the nucleus of its political system. The growth of the party's leading role in the contemporary stage of communist construction.

Question No 28

1. The beginning of the Great Patriotic War. Mobilization of the forces of the Sovet people to fight the enemy. The rout of the German fascist troups near Moscow.

2. The behests of V. I. Lenin to Soviet youth ("The Tasks of Youth Unions"). The komsomol—an active assistant and party reserve. The 17th komsomol congress; its decisions and significance.

Question No 29

1. The essential turning point in the course of the Great Patriotic War and its international significance.

2. The USSR—a single united multinational state. Nations and nationalities under socialism. The Soviet nation—a new historic community of people.

Question No 30

1. The heroic struggle of Soviet partisans. The self-sacrificing labor of the Soviet people in the rear during the years of the Great Patriotic War.

2. The class struggle in the development of the society. The world-wide historic mission of the working class. The peculiarities of the class struggle in the modern world.

Question No 31

1. The attack of the Soviet army in 1944-1945 and its decisive role in the liberation of the peoples of foreign countries from Hitler's oppressors. The completion of the defeat of fascist Germany.

2. The creation of a material and technical base for communism—the main economic task of the communist party and the Soviet people.

Question No 32

1. The defeat of imperialist Japan. The worldwide historic significance of the victory of the Soviet Union in the Great Patriotic War.

2. The method of production—the material basis for the life of the society.

Question No 33

1. Postwar restoration and further development of the USSR national economy (1945-1958).

2. Material and forms of its existence.

Question No 34

1. The 20th CPSU Congress and its significance.

2. The knowability of the world; social historical practice—the basis of cognition and criterion of truth.

Question No 35

1. Science, culture and public education in the USSR during the period of developed socialism and communist construction. The worldwide significance of socialist culture.

2. The economic policy of the CPSU and the Soviet state in the modern stage.

Question No 36

1. The 24th CPSU; its historical significance. The main results of the Ninth Five-Year Plan.

2. The working masses—a decisive force in social development. The role of the individual in history. The increased role of the masses of people in the modern epoch.

Question No 37

1. The 25th CPSU Congress; the basic direction of development of the USSR national economy for 1976-1980. The historical significance of the Congress.

2. Marxism-Leninism on the development and change of socio-economic formations.

Questions on Physics

Question No 1

1. The relativity of mechanical movement. Path and motion. Addition of motions and speeds.

2. Ideal gas. The derivation of the equation of the condition of ideal gas (Mendeleyev-Klapeyron equation).

3. Laboratory work: determination of the specific resistance of a conductor.

Question No 2

1. Uniformly accelerated direct linear movement. The equation for the coordinates of a point in uniformly accelerated movement.

2 . Sustained electromagnetic oscillation. Generator of sustained electromagnetic oscillation.

3. Laboratory work: determination of the coefficient of surface tension of a liquid.

Question No 3

1. Newton's first law. Mass of a body. Force. Newton's second law. Examples of their manifestation in nature and technology.

2. The construction and principle of operation of a transformer. Transmission and utilization of electric power. Successes in electrification and its development under the Tenth Five-Year Plan.

3. Laboratory work: determination of the focal distance of a converging lens.

Question No 4

1. The law of impulse conservation. Jet propulsion. K. E. Tsiolkovskiy—the author of the theory of space flights. USSR successes in the mastery of space.

2. The properties of the p-n junction. The semiconductor diode; its application for rectification of a current.

3. Laboratory work: determination of the indicator of refraction of glass.

Question No 5

1. Potential and kinetic energy. The law of conservation of energy in mechanical processes.

2. The spector of electromagnetic rays. Properties of individual parts of the spector of electromagnetic rays and their application.

3. The problem of heat exchange taking into account changes in the aggregate condition of the substance.

Question No 6

1. The law of universal gravitation. The force of gravity. The weight of a body. Weightlessness.

2. Internal energy and methods of changing it. The law of conservation of energy taking into account heat exchange.

3. Laboratory work: assembly of an existing model of a radio receiver.

Question No 7

1. The magnetic field of a current. Induction of a magnetic field. Lawrence force.

2. Mechanical work and power.

3. The problem of applying the formula for the period of swing of a simple pendulum.

Question No 8

1.

Free and forced mechanical oscillations. Harmonic oscillations.

2. Radioactivity. The properties of nuclear rays.

3. The problem of calculating an electrical series with parallel and sequential joining of conductors.

Question No 9

1. Alternating electrical current. Active, inductive and capacitant resistant.

2. Thermal expansion of liquids and solids.

3. The problem of applying the laws of light reflection.

Question No 10

1. Free and forced electrical oscillations in contour. The frequency of the contour's own oscillations. Resonance and its application in radiotechnology.

2. The conditions for equilibrium of a body which has a rotation axis. The law of momentum. The center of masses. Kinds of equilibrium.

3. A graphic problem with gas laws.

Question No 11

1. The law of conservation of electrical charges. The coulomb law.

2. Light dispersion. The spectroscope.

3. Laboratory work: determination of the relative humidity of the air.

Question No 12

1. The electric field. Electric intensity.

2. Newton's third law; examples of its manifestation.

3. A problem of applying the concept of quantum light and the phenomenon of photo-effect.

Question No 13

1. The operation of forces in an electric field with displacement of the charge. Difference in potentials.

2. Main points of molecular kinetic theory and their experimental confirmation. The works of M. V. Lomonosov. Math, speed and dimensions of molecules.

3. A problem with the application of the lens formula.

Question No 14

1. Electrical capacitance. Capacitors. The energy of a charged capacitor (without derivation from the formula). The application of a capacitor in technology.

2. Distribution of oscillations in an elastic medium. Transverse and longitudinal waves. The speed of distribution of waves.

3. A problem with th application of the Mendeleyev-Klapeyron equation.

Question No 15

1. Electric motive force. The Ohm law for a closed circuit.

2. Sound waves. The speed of sound. The force and altitude of sound. Acoustic resonance.

3. A problem with the application of the formula for orbital velocity.

Question No 16

1. The nature of electrical current in a vacuum. Thermo-electron emission; its utilization in electronic instruments. Properties of electron beams.

2. Laws of refraction of light. Complete reflection of light.

3. A problem with calculations of the operation of the force of gravity or the force of resilience.

Question No 17

1. The nature of an electrical current in electrolytes. Laws of electrolysis. The application of electrolysis in technology.

2. The eye as an optical system. Glasses. The camera.

3. A problem with the determination of the coordinates of a body that has been thrown vertically upward.

Question No 18

1. Intrinsic and impure electrical conductivity of semiconductors and its dependence on temperature and lighting. The application of semiconductor instruments.

2. Lenses. The construction of images in fine lenses. The lens formula (without derivation). The optical force of the lens.

3. Laboratory work. Determination of the mechanical power and efficiency factor of an electric engine when raising a load.

Question No 19

1. The nature of an electrical current in metals. The Ohm law for a section of a circuit. The dependency of resistance of metals on temperature.

2. Ways and quantum properties of light.

3. Laboratory work: determination of the density of a substance.

Question No 20

1. The electromagnetic field and its materiality. The open oscillatory circuit. Electromagnetic waves and their properties.

2. Work when changing the volume of gas. The principle of operation of thermal engines. The efficiency factor of thermal engines. The utilization of thermal machines in the national economy.

3. A problem calculating work, taking friction into account.

Question No 21

1. The principle of radio telephone communications. Modulation and demodulation. The simplest radio receiver,

The invention of the radio by A. S. Popov.

2. Pascal's law. Buoyancy force. The condition of floating bodies; the floating of ships; aerostation.

3. A problem with the law of conservation and transformation of energy with application to mechanical and thermal processes.

Question No 22

1. The basic equation of the molecular-kinetic theory of gasses (without derivation). Temperature—a measure of the average kinetic energy of molecules.

2. The principle of radio location. Its application for discovering various objects. Radio location of planets. Development of means of communication in the USSR.

3. A problem with the calculation of forces with the movements of a body around a circumference.

Question No 23

1. The phenomenon of electromagnetic induction. Electromotive force of induction. The Lents rule.

2. Experimental methods of registration of charged particles: the Wilson chamber, the Geiger counter, the photoemulsion method.

3. A task with the application of the rule of force moment.

Question No 24

1. Photoelectric effect. The works of A. G. Stoletov on photoeffect. The laws of photoeffect; their explanation on the basis of quantum concepts. Photo elements and their application.

2. Magnetic properties of substances. Magnetic permeability.

3. A problem with uniformly accelerated movement of a body in a horizontal direction taking into account the force of gravity.

Question No 25

1. Experiments and phenomena that confirm the complexity of the structure of the atom. A model of the Rutherford atom. The Bohr hypotheses.

2. The phenomenon of self induction. Inductivity. Taking self induction into account in technical equipment.

3. Laboratory work: determination of the acceleration of free fall..

Question No 26

1. Continuous and line radiation spectra. Absorption spectra. Spectral analysis and its utilization in astronomy and technical equipment.

2. Crystals. Anisotropy of crystals. Semicrystals. Amorphous bodies.

3. A problem in electrostatics for determining the current of an electric field or the potential at a point that is a certain distance away from two charged particles.

Question No 27

1. The structure of the atomic nucleus. The proton and the neutron. The interconnection between mass and energy. The energy of the nuclear bond.

2. Deformation of bodies. Resiliency force. Hooke's law. Examples of the application of the formations in technical equipment.

3. A problem with the thermal action of a current or the transformation of electric energy into mechanical energy, taking into account the efficiency factor.

Question No 28

1. Fission of the uranium nucleus. Change reaction. Liberation of energy in nuclear fission. Thermonuclear reaction. The development of atomic energy in the USSR.

2. Surface tension. Moistening and capillary action; accounting for and utilizing them in technical equipment and agriculture.

3. Laboratory work: determination of the internal resistance and the electromotive force of a source of current.

Question on Chemistry

Question No 1

1. The periodic law and the periodic table of chemical elements in light of the theory of atomic structure. The significance of the periodic law in the development of science and in a dialectical materialist understanding of nature.

2. Starch, its structure, its properties and application.

3. Experimental problem. Using characteristic reactions, determine each of three inorganic substances.

Question No 2

1. Kinds of chemical bonds (ionic, covalent, metallic hydrogen).

2. Glucose, its structure, its properties and application.

3. Experimental problem. Using characteristic reactions, determine each of three inorganic substances.

Question No 3

1. Types of chemical reactions: combination, decomposition, replacement, exchange; the peculiarities of oxidation-reduction reactions.

2. Petroleum as a natural source of hydrocarbons, its composition and the main methods of industrial processing.

3. Experimental problem. Create the reactions that are typical for a given organic substance.

Question No 4

1. The speed of chemical reactions. The dependency of the reaction speed on the nature of reagents, the concentration, the temperatures and the catalyst.

2. Fats. Their structure and properties, methods of technical processing. Possibilities of replacing fats in the technology of nonfood raw material.

3. Experiment. Obtain an amphoteric hydroxide and cause the reactions that characterize its chemical properties.

Question No 5

1. The reversability of chemical reactions. Chemical equilibrium, methods of changing equilibrium.

2. Phenol, its structure, properties and application.

3. Experiment. Test solutions of three salts with an indicator and explain the results of the tests.

Question No 6

1. Oxides, their classification and a description of their chemical properties.

2. A general description of polymers: composition and structure, properties and reactions that lie at the basis of obtaining them. The most important representative plastics.

3. Experimental problem. Using typical reactions determine each of two organic substances.

Question No 7

1. Bases, their classification and a description of their chemical properties in light of the theory of electrolytic dissociation. Conditions of the course of reactions of exchange between electrolytes in solutions until completion.

2. Proteins, their composition, their primary, secondary and tertiary structure, their properties, and the role of proteins in the life of organisms.

3. Calculation-experimental problem. Cause the actions that confirm the quantitative composition of a given inorganic substance and calculate the percentage composition of the substance.

Question No 8

1. Acids, their classification and a description of their chemical properties in light of the theory of electrolytic dissociation.

2. Isomerization of organic compounds, their kinds.

3. Calculation problem. Calculate the volume of gas required for a reaction with a certain volume of another gas.

Question No 9

1. Salts, their classification and a description of their chemical properties in light of the theory of electrolytic dissociation. The electrochemical theories of stress of metals.

2. Acetylene, its structure, properties and production.

3. Experimental problem. Cause reactions that are typical for a given organic substance.

Question No 10

1. Chemical properties of alkaline metals on the basis of their positions in the periodic table of elements and the structure of their atoms.

2. Amino acids, their structure, properties, biological significance and utilization in industry.

3. Calculation problem. Calculate the quantity of a given substance that is obtained with the reaction if one knows the quantity of each of the initial substances and one of them is in excess.

Question No 11

1. Chemical properties of halogens on the basis of their positions in the periodic table of elements and the structure of their atoms. Comparative chemical activity of halogens.

2. Cellulose, its structure, properties and applications.

3. Calculation-experimental problem. Obtain a given substance by an exchange reaction and calculate from the reaction equation the quantity of each of the initial substances that is required to obtain the given quantity of the product.

Question No 12

1. A description of the chemical properties of metal on the basis of their positions in the periodic table of elements and the structure of their atoms.

2. A classification of fibers. Acetate fiber as representative of artificial fibers and caprone as representative of synthetic fibers, their structure, properties and how they are obtained industrially.

3. Calculation problem. Calculate the quantity of product from a reaction if a certain quantity of initial substance is taken for it in the form of a solution of a given concentration in percentages.

Question No 13

1. The theory of electrolytic dissociation: the mechanism of solution in water of substances with various bonds, the properties of ions, the degree of dissociation, strong and weak electrolytes.

2. Aniline, its structure, properties and application.

3. Experimental problem. Using typical reactions determine each of two given organic substances.

Question No 14

1. The role of chemistry in the development of the most important branches of industry and agriculture. The 25th CPSU [Communist Party of the Soviet Union] Congress on the development of the chemical industry in the USSR and the tenth five-year plan.

2. Aldehydes, their structure and properties. Obtaining and applying formaldehyde and acetaldehyde.

3. Experiment. Obtain and gather a gaseous substance; prove experimentally the presence of the given gas.

Question No 15

1. The theory of the chemical structure of organic compounds of A. M. Butlerov, the main directions in its current development. The significance of the theory of the structure for the development of science and a dialectical materialistic understanding of nature.

2. Nitric acid, its properties and application. Reaction equations for industrial production.

3. Calculation problem. Calculation of the volume of gas obtained from a given quantity of an initial substance that contains a given quantity of impurities.

Question No 16

1. The mechanism of substitution reactions (using individual hydrocarbons of the ethylene series).

2. Scientific fundamentals of the production of sulphuric acid: chemical reactions, selection of optimal conditions, principles of setting up equipment, general principles of production.

3. Experiment. Obtain and gather a gasseous substance; prove experimentally the presence of the given gas.

Question No 17

1. The mutual effects of atoms in molecules of organic substances, their explanation on the basis of electronic concepts.

2. Mineral fertilizers, their kinds, composition and properties. The most important phosphorous, nitrogen and potassium fertilizers and how to obtain them.

3. Experiment. Cause reactions that are typical of a given organic substance.

Question No 18

1. The genetic link between the main classes of organic compounds.

2. Electrolysis of solutions and fusions of salts. Electrolytic production of aluminum.

3. Calculation problem. From the quantity of precipitates with a thermal reaction and a given quantity of the initial substance, formulate a thermal chemical equation.

Question No 19

1. Saturated hydrocarbons, their structure, properties, and basic courses of industrial treatment.

2. Hydrolysis of salts.

3. Calculation problem. Calculate the quantity of the product of a reaction, if a defined amount of raw material is used for it containing a given quantity of impurities.

Question No. 20

1. Unsaturated hydrocarbons of the ethylene series, their structure, properties, production and utilization in industrial synthesis.

2. The corrosion of metals as a redox process. Kinds of corrosions, measures for preventing corrosion.

3. Calculation-experimental problem. Obtain a given substance by exchange reaction; calculate from the reaction equation the quantity of each of the initial substances that is necessary for obtaining a given quantity of the product.

Question No 21

1. Benzine as representative of aromatic hydrocarbons, its structure, properties, application and production.

2. Scientific fundamentals of producing synthetic ammonium: chemization of the process, selection of optimal conditions, principles of arrangement and action of the synthesis column.

3. Calculation problem. Calculate the output of the product of reaction in percentages from the theoretically possible if one knows the quantity of the initial substance and the product that is obtained.

Question No 22

1. Saturated monoatomic spirits, their structure, properties and application.

2. Scientific fundamentals of steel production: chemical reactions, conditions for their taking place, principles of arrangement and operation of a Martin furnace and an oxygen converter.

3. Calculation-experimental problem. Cause reactions that confirm the quantitative composition of a given inorganic substance and calculate the percentage composition of this substance.

Question No 23

1. Monobasic carbon acids, their structure, properties, application and general methods of production.

2. Scientific fundamentals of producing iron: chemical reactions, conditions for their taking place, principles of arrangement and operation of a blast furnace, the main kinds of products.

3. Experiment. Obtain and gather a gaseous substance; prove experimentally the presence of the given gas.

Question No 24

1. A general description of rubbers: their structure, properties and kinds of rubbers. Synthetic isoprene rubber.

2. Ammonia, its structure, properties and application.

3. Calculation problem. Find the molecular formula of a gas on the basis of a given quantitative analysis and the relative absorption of this gas in terms of another gas.

Questions on a Foreign Language (English, German, French, Spanish)

Question No 1

1. Report on a subject.

2. Reading of a text about the life of youth in our country (abroad) using a dictionary. Presentation of the content of what has been read.

Question No 2

1. Report on a subject.

2. Reading of a popular scientific text using a dictionary. Presentation of the content of what has been read.

Question No 3

1. Report on a subject.

2. Reading of an artistic text using a dictionary. Presentation of the content of what has been read.

Question No 4

1. Report on a subject.

2. Reading of a text on the cultural life in our country (abroad) without using a dictionary. Presentation of the basic content of what has been read.

Question No 5

1. Report on a subject.

2. Reading of a text about sports life in our country (abroad) using a dictionary. Presentation of the content of what has been read.

Question No 6

1. Report on a subject.

2. Reading of a text about political life in our country (abroad) using a dictionary. Presentation of the content of what has been read.

Question No 7

1. Report on a subject.

2. Reading of a text about political life in our country (abroad) without using a dictionary. Presentation of the main content of what has been read.

Question No 8

1. Report on a subject.

2. Reading of a text about the economic life in our country (abroad) using a dictionary. Presentation of the content of what has been read.

Question No 9

1. Report on a subject.

2. Reading of an artistic text using a dictionary. Presentation of the content of what has been read.

Question No 10

1. Report on a subject.

2. Reading of a text about the life of youth in our country (abroad) without using a dictionary. Presentation of the main content of what has been read.

Question No 11

1. Report on a subject.

2. Reading of a text about political life in our country (abroad) using a dictionary. Presentation of the content of what has been read.

Question No 12

1. Report on a subject.

2. Reading of a text about sports life in our country (abroad) without using a dictionary. Presentation of the main content of what has been read.

Question No 13

1. Report on a subject.

2. Reading of a text about cultural life in our country (abroad) using a dictionary. Presentation of the content of what has been read.

Question No 14

1. Report on a subject.

2. Reading of a text about the country of the language being studied using a dictionary. Presentation of the content of what has been read.

Question No 15

1. Report on a subject.

2. Reading of a popular scientific text using a dictionary. Presentation of the content of what has been read.

Question No 16

1. Report on a subject.

2. Reading of an artistic text using a dictionary. Presentation of the content of what has been read.

Question No 17

1. Report on a subject.

2. Reading of a text about political life in our country (abroad) without using a dictionary. Presentation of the main content of what has been read.

Question No 18

1. Report on a subject.

2. Reading of a text about the country of the language being studied using a dictionary. Presentation of the content of what has been read.

Question No 19

1. Report on a subject.

2. Reading of a popular scientific text without using a dictionary. Presentation of the main content of what has been read.

Question No 20

1. Report on a subject.

2. Reading of an artistic text using a dictionary. Presentation of the content of what has been read.

Appendix

Questions for ~~Grad~~ Graduation Examinations for Evening (Shift) and Correspondence Schools

Questions on Algebra and the Elements of Analysis*

Question No. 1

1. The linear function, its properties and graph.

2. The area of a curvilinear trapezoid (give an example).

3. Proof of a trigonometric identity.

Question No. 2

1. The exponential function, its properties and graph.

2. A necessary condition for an extremum (Fermat's Theorem).

3. The solution of a trigonometric equation.

Question No. 3

1. The definition of the derivative. The tangent to the graph of a function.

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*In this context, Analysis means Differential and Integral Calculus. (Comment by Dr. Izaak Wirszup, Professor of Mathematics, University of Chicago, to whom appreciation is expressed for reviewing and refining the translation of this section).

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2. The solution of one of the trigonometric equations:

$\sin x=a$; $\cos x=b$; $\tan x=c$

3. The solution of a logarithmic equation.

Question No. 4

1. The theorem on the derivative of the sum of two functions.

2. Reduction formulas (work out one formula).

3. Construction of the graph of a quadratic function.

Question No. 5

1. The theorem on the derivative of a product of two functions.

2. A necessary condition for the convergence of a sequence (formulate and illustrate with examples).

3. Finding the domain of definition of a function.

Question No. 6

1. The theorem on the derivative of a power function with a natural number exponent greater than one.

2. The formulas for the sum and difference of the same trigonometric functions (work out one formula).

3. The investigation of a function regarding monotonicity, extrema.

Question No. 7

1. The theorem on the derivative of the quotient of two functions.

2. The property of the graph of an odd function (illustrate with an example).

3. Computing an integral.

Question No. 8

1. The periodicity of the trigonometric functions.

2. The rule for finding the largest and the smallest value of a function on an interval (formulate and illustrate with an example).

3. Finding a primitive function.

Question No. 9

1. The relationships between trigonometric functions of one and the same argument.

2. The geometric illustration of solving a system of linear equations with two variables (consider one case).

3. The problem of finding the velocity and acceleration of a motion at a given instant.

Question No. 10

1. The derivative of the sine function.

2. The definition of a function continuous at a point (examples).

3. The solution of a system of linear inequalities.

Question No. 11

1. The derivative of the cosine and the tangent functions.

2. The properties of graphs of mutually inverse functions (illustrate with an example).

3. The solution of a quadratic inequality.

Question No. 12

1. The properties of the sine function, its graph.

2. The theorems on the limits of a function (formulate and give examples of application).

3. Computing the area of a figure, bounded by given lines.

Question No. 13

1. The integral from a to b of the function f (definition). The geometric meaning of the integral.

2. A sufficient condition for the increment of a function on an interval (formulate and illustrate with examples).

3. The solution of an irrational equation.

Question No. 14

1. The properties of the cosine function, its graph.

2. A sufficient condition for the existence of a maximum (minimum) of a function (formulate and illustrate with examples).

3. The solution of an exponential equation.

Question No. 15

1. The properties of the tangent function, its graph.

2. The derivative of the exponential and the logarithmic functions (work out one formula).

3. The solution of a system of two linear equations with two variables.

Question No. 16

1. The logarithmic function, its properties and graph.

2. The trigonometric functions of the double argument (work out one formula).

3. The composition of an equation of the tangent to a graph.

Question No. 17

1. The basic property of primitive functions.

2. The concept of equivalence of equations and of systems of equations (give examples).

3. The construction of the graph of a trigonometric function.

Question No. 18

1. The sum of an infinite geometric progression with $|q| < 1$.

2. Three rules for finding primitive functions (without proof).

3. The solution of a system of nonlinear equations.

Question No. 19

1. Investigation of a quadratic function.

2. Trigonometric functions of a half argument (work out one formula).

3. Finding a primitive function.

Question No. 20

1. The derivative of a power function with a real number exponent.

2. The property of the graph of an even function (illustrate with an example).

3. The solution of a trigonometric inequality.

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